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Construction Methods

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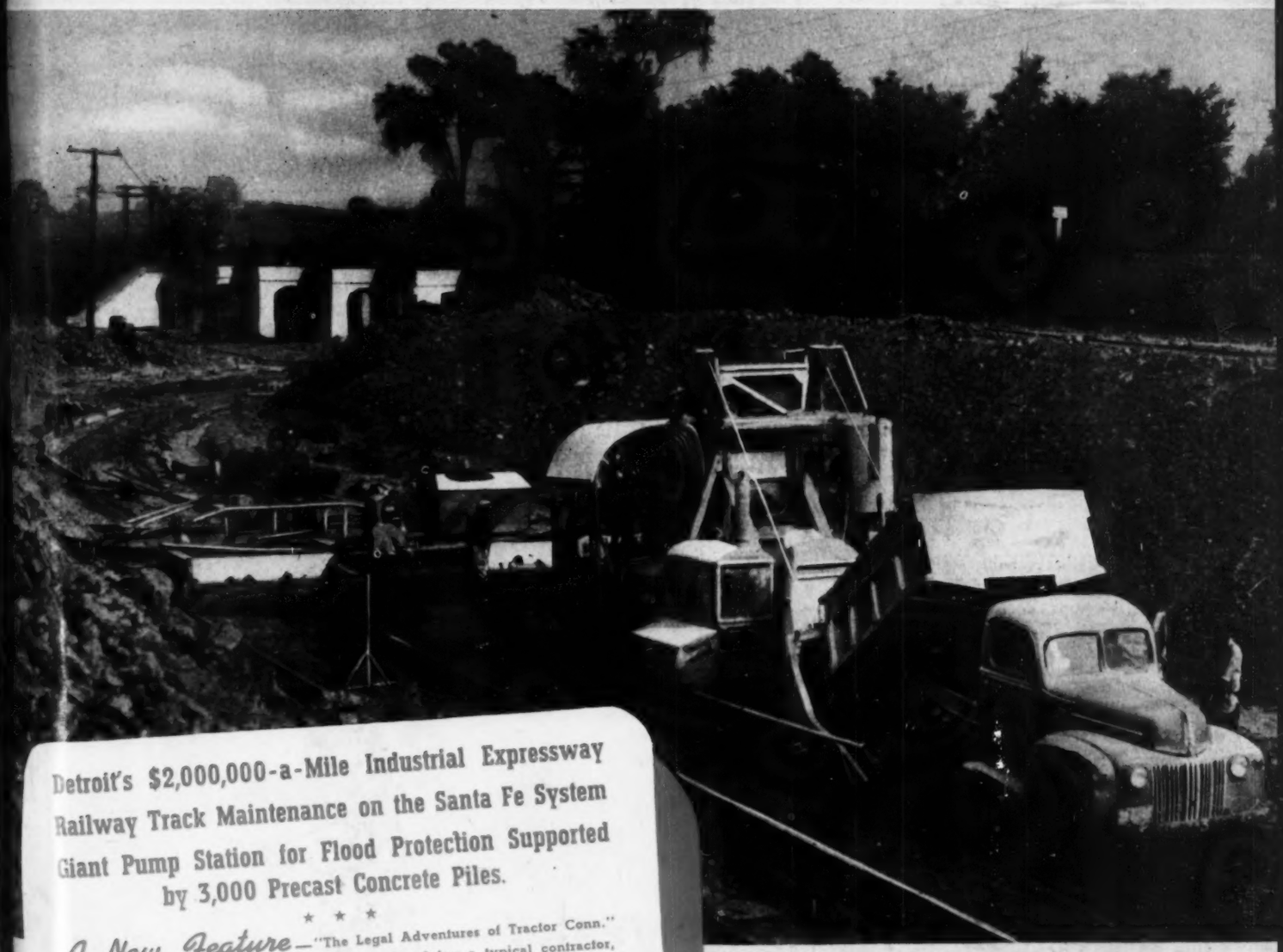

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The interlocks of Inland steel sheet piling are designed for strength and for ease of assembly and driving—designed to be watertight in a cofferdam, yet pull easily.

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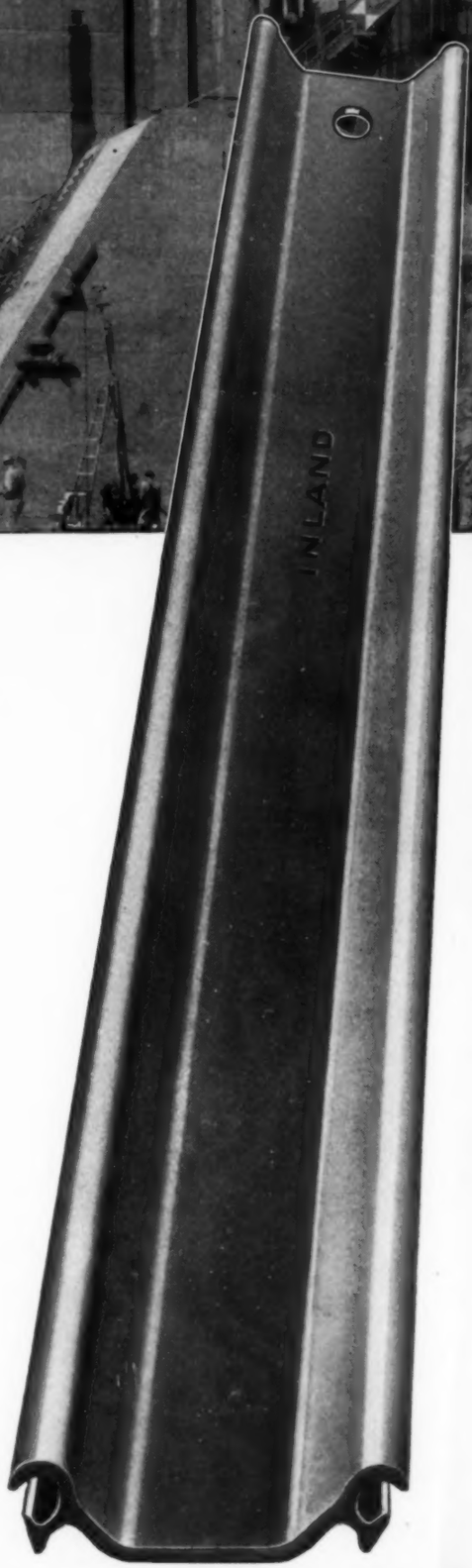

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CURRENT JOBS

. . . and Who's Doing Them

BUILDINGS

Public—Iron ore blast furnace at Rusk, Tex., will be built by **McCrossin Engineering Co.**, of New York, N. Y., for $2,500,000. **R. P. Farnsworth & Co., Inc.**, of New Orleans, La., has $2,210,744 contract for 500-unit housing. **Haddock Engineers, Ltd.**, of Oceanside, Calif., has $1,746,651 Navy contract for communications school. Another Navy contract for storehouses at Yorktown, Va., was awarded to **Virginia Engineering Co.**, of Newport News, for $1,388,300. **Penker Associates, Inc.**, of Cincinnati, Ohio, will build $1,129,000 hospital addition at Chillicothe. Low bid of $952,187 for warehouses at Wilmington, Calif., was submitted by **Robert E. McKee Co.**, of Los Angeles.

Industrial—Starch plant at Clewiston, Fla., will be built by **U. S. Sugar Corp.** of Clewiston, for $7,000,000. **Foundation Co. of Canada, Ltd.**, of Toronto, Ont., has $1,500,000 contract for pulp mill at Peninsula. Grain elevator at Windsor, Ont., will be built for $1,000,000 by **Pigott Construction Co., Ltd.**, of Hamilton.

HEAVY CONSTRUCTION

Navy contract for breakwater at Terminal Island, Calif., went to **Guy F. Atkinson Co.**, of Long Beach, for $3,500,000. **Don Construction, Ltd.**, of Leeside, Ont., is low bidder on $2,800,000 railway line in Quebec. Contract for tunnels in Washington was awarded to **General-Shea-Morrison**, of Seattle, for $1,848,927. Runways at El Centro, Calif., will be built by **Ferry & Polk**, of Los Angeles, for $1,768,518. **McNamara Construction Co., Ltd.**, of Toronto, Ont., has $1,750,000 contract for airport work at Goose Bay, Labrador. Low bidder on $1,660,682 contract for earthwork in Arizona was **J. F. Shea Co.**, of Los Angeles, Calif. **Tom Graham Drilling Co.**, of San Antonio, Tex., has $1,600,000 contract for oil wells at Raymondville. **A. Guthrie & Co.**, of St. Paul, Minn., was awarded $1,500,000 Montana railroad contract. **F. D. Cline**, of Raleigh, N. C., submitted low bids of $1,241,748 and $1,240,588 for airport excavation, concrete and blacktop paving at Danville, Va. **C. B. Warren**, of Spokane, Wash., will build aqueducts at Provo, Utah, for approximately $1,200,000. Airport improvement contract at Wilson, N. C., was awarded to **E. W. Grannis**, of Fayetteville, for $1,157,980. Runways at McClellan Field, Calif., will be built by **A. Teichert & Son**, of Sacramento, for $1,105,007. **Tobell Construction Co.**, of Baltimore, Md., will build temporary dwellings at Sollers Point, for $1,074,400. Airport at Natchez, Miss., will be built by **D. W. Winkelman Co.**, of Syracuse, N. Y., for $1,000,000.

HIGHWAYS

Among recent highway contract awards are the following: Alabama: $202,929 to **R. W. Wright & Son**, of Columbus, Ga. Illinois: $308,534 to **Moore Bros.**, of East St. Louis. Indiana: $195,408, $230,867, $133,216 and $164,135 to **Middle West Roads Co.**, of Noblesville; $302,208 to **Rock Road Construction Co.**, of Chicago, Ill.; $202,819 to **Ralph Rogers & Co.**, of Bloomington; $226,280 to **Rieth-Riley Construction Co.**, of Goshen; $259,887 to **S. G. Hayes & Co.**, of Chicago; $253,326 to **Payne & Deland**, of Milwaukee, Wis.; $257,648 to **Mid-America Engineering Corp.**, of Skokie, Ill.; $268,953 to **Gast Construction Co.**, of Warsaw; and $305,478 to **Brooks Construction Co.**, of Fort Wayne. Michigan: $219,539 to **Louis Garavaglia & Sons**, of Detroit. Tennessee: $35,316 to **R. E. Martin**, of Nashville.

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Construction Methods

A Pictorial Survey of Current Practice, Equipment and Materials

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APRIL, 1944

THE *How* OF IT

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

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How **TWO-CRANE TEAM** drove long batter piles —p. 56

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Disposal of Government War Plants and Equipment

In the last four years, the Federal Government has spent over fifteen billion dollars on war plants—two-and-one-half times as much as was spent by private investors.

Of this fifteen-billion-dollar government investment, about one-third has gone into facilities for the manufacture of aircraft and for ship construction and repair; another third has gone into plants for production of combat ordnance; and the remaining third has gone into a variety of facilities for making synthetic rubber, metal products, machinery, and miscellaneous equipment.

Most of these plants are in industries that are expanded far beyond peacetime requirements. Furthermore, their convertibility to other civilian uses will, in many cases, be complicated by their specialized equipment and layout, by their tremendous size, and by their uneconomic location. At the moment, it looks as if roughly one-third of the government-owned plants and equipment can be converted fairly readily to peacetime operation, and will, therefore, be easily disposable to private enterprise.

The discovery of unsuspected uses for war plants and equipment may well raise the disposable proportion to one-half or more. The government, at the end of the war, may own about one-eighth of the commercially-usable industrial capacity of the country. It will be by far the largest owner of machine tools; it will own enormous aluminum capacity, magnesium capacity, many miles of pipe lines, and more ships than the entire private shipping industry.

What the government does with its war plants will have a profound effect on the free enterprise system and on all workers, employers, investors, and consumers who have a part in that system. If this problem is handled badly, we may find ourselves enmeshed in a trend toward monopoly and government operation of industry. If the problem is handled well, we shall have taken a big step toward freedom of action in a competitive society, toward full opportunities for business enterprise, toward well-paid productive jobs for workers, and toward a higher standard of living for us all.

Recently, three important events have signalled encouragement. They are the report of Senator George's Committee, the Baruch report, and the report of Senator Truman's Committee. These reports are noteworthy for their competent sizing up of a complex problem, for their recognition of the major responsibility of government in making a successful transition to peace, for their insistence on wise policy and good administration, and for their genuine concern that our productive powers be given full opportunity in a free private enterprise system. These reports agree on basic principles and many specific lines of action. There are, however, important areas of policy formation, organization, and procedure—especially in regard to plant disposal—which remain to be blue-printed.

In formulating the policies and practices to be followed in dealing with government war plants, our major goal must, of course, be a high level of production and employment in private business after the war.

Government operation in competition with private employers and privately-employed workers will not be desirable because it will make investment unattractive to private capital and will limit opportunities for private employment. On the other hand, sales to private buyers which result in increasing the concentration of industry will also be undesirable. We must use this opportunity to strengthen the competitive enterprise system and to move away from, not toward, the concentration of economic power in either public or private agencies.

To accomplish these objectives, a program of action such as follows will be necessary:

1. An adequate reconversion organization will be needed in the government, but its powers and responsibilities should carefully be defined by Congress. Fortunately, an able Administrator of Surplus War Property already has been appointed. It will be essential for him to work in closest cooperation with Congress and with the Armed Forces and other executive agencies. The Office of War Mobilization, and ultimately the President, must be responsible for seeing that the Surplus War Property Administration is not sidetracked by the operating agencies and is not dominated by their sheer size. Funds must be supplied generously to the Surplus War Property Administrator, so that he can set up an organization adequate to cope with this huge and complex job. Business, too, must be generous in loaning top-flight executives for postwar government service.

2. One of the first acts of the Surplus War Property Administration will have to be to assemble a complete inventory of government war plants and equipment, to make possible the planning and control of the disposal process, and to form the basis of catalogues of property available for sale.

3. Cooperation between the executive and legislative branches of the government will be needed to develop at least tentative plans with respect to matters of public policy which are of special importance to a successful transition to peace. Among these matters are the size of the military establishment to be maintained in time of peace, the stand-by facilities and reserves of materiél necessary for our security in case of future war, and our policy regarding import and production of synthetic rubber and other critical and strategic materials.

4. The Surplus War Property Administrator should obtain fom the Armed Forces, acting under congressional directives, specification of those plants which are needed to supply our peacetime Army and Navy and to provide the essential reserve capacity in case of war.

5. The Surplus War Property Administrator should select certain war plants as depots in which to store the huge surpluses of inventories and equipment which will have to be removed from private and government-owned factories in order to make possible their conversion to civilian use.

6. Those plants which are not desired by the Army or the Navy, which are not needed for storage, and which clearly will be unsuitable for peacetime utilization should be scheduled for dismantling and disposal piecemeal.

7. The two or three billion dollars' worth of government facilities intermingled with private plant should receive attention with a view to early sale, temporary continuance or use under lease, or early removal.

8. The various plants and pieces of equipment available for sale to private business should be classified conveniently, catalogued, and advertised to prospective buyers or lessors. Before the Surplus War Property Administrator offers, for private sale, plants and equipment not desired by the Army or the Navy, he should ascertain whether the plants or equipment are desired by other branches of the government or by public corporations such as the T.V.A.

9. Whenever property can be sold at prices approximating depreciated reproduction cost, that will be by far the best solution. Generous time-payment terms should be offered. In many cases the government may be unable to sell the property for reproduction cost less depreciation, for the simple reason that no one would think of reproducing it. The property may already be partly obsolete or, because of its size, location, or other characteristics, may only be moderately well suited for commercial use. This should not prevent the government from selling it, provided a price which fairly represents the worth of the property can be obtained. The best test of that worth is the price produced by active bidding under favorable market conditions.

10. When property cannot be sold at a fair price, temporary leases with options to buy should be employed to get the facilities into productive use. This should not, however, be done on terms which would cause unfair competition or create clearly excessive capacity in an industry. And the lease must be temporary; it must not be the means to prolong government control or ownership.

11. The government should offer the strongest possible resistance to local groups or industry groups seeking subsidies for continued operation of war properties. Subsidies will burden the Treasury and lead to inefficient use of resources. They will be justified only to maintain facilities needed for national security.

12. The plants and equipment offered for sale and lease should include sufficient quantities in small enough lots to satisfy the demands from small business. The war has tended to concentrate production in larger plants. After the war, we should seek a wider distribution of the government war facilities.

13. Insofar as possible, war buildings and equipment should be offered for sale in units which can be purchased by businesses in peacetime industries. Many of these industries have had to get along during the war without adequate replacement and expansion, and will be ready to buy if they are able to get what they want from the government. This is a particularly desirable market for surplus government property since these industries are, for the most part, not faced with the problems of excess capacity.

14. Property, such as machinery and other movable equipment, which is in excess of our domestic requirements or is more urgently needed by other countries, should be exported. We shall need, and can take, large supplies of raw materials in return.

15. Property which is not needed by the Armed Forces, which cannot be sold or leased on terms which would be fair to competing plants, which cannot be dismantled and distributed piecemeal, and which cannot be sold abroad, should be scrapped as soon as its non-disposability is apparent. The disposal of war plants should be completed within three to five years.

16. All negotiations for sale or disposal should be matters of open public record. As Mr. Baruch has said, the process must be conducted in a goldfish bowl. This is as much for the protection of business as for the protection of the government.

These courses of action do not include everything that must be done, but they do indicate the general lines along which our surplus war plant disposal must proceed if it is to avoid precipitating needless transition unemployment.

The gravest danger of all will be red tape, intergovernmental conflict, and inadequate administration. It would be a great misfortune for the executive and legislative branches to quarrel over details of organization when they agree on the basic principles to be followed in handling the problem. Obviously, the Surplus War Property Administration must cooperate with Congress and look to it for policy guidance. Just as obviously, the disposal problem will involve great difficulties of administration which must not be complicated by congressional interference. We shall need the best we can get in careful policy making, detailed planning, good organization, and courageous action. This is a matter of vital importance to every American. The stakes are too high to tolerate poor administration or petty politics.

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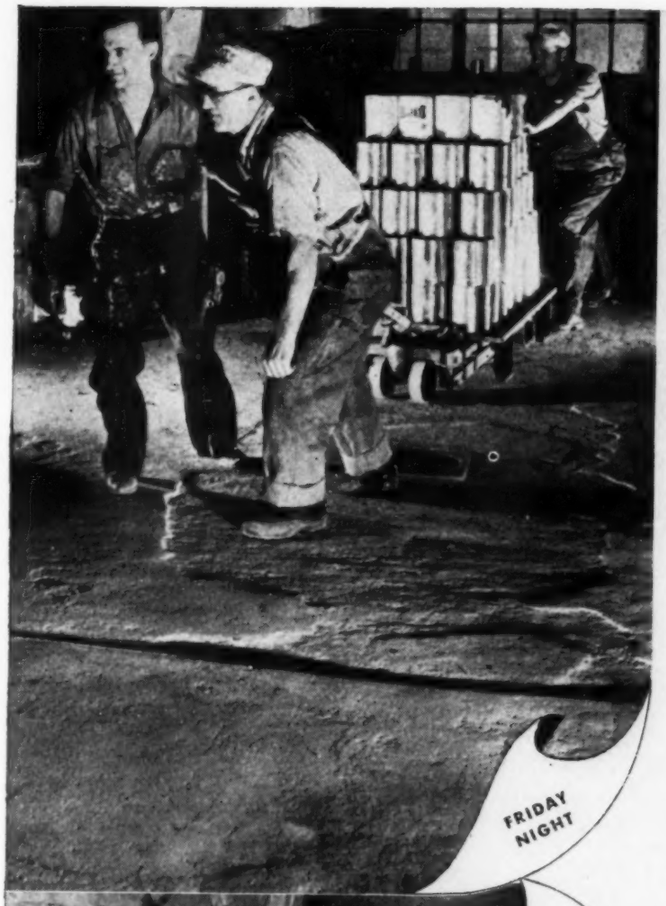

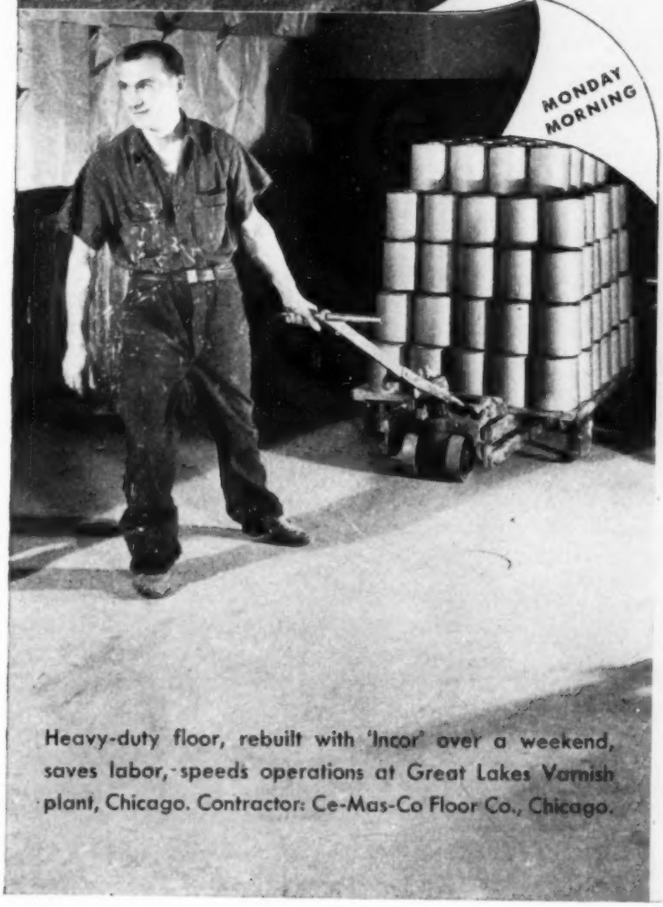

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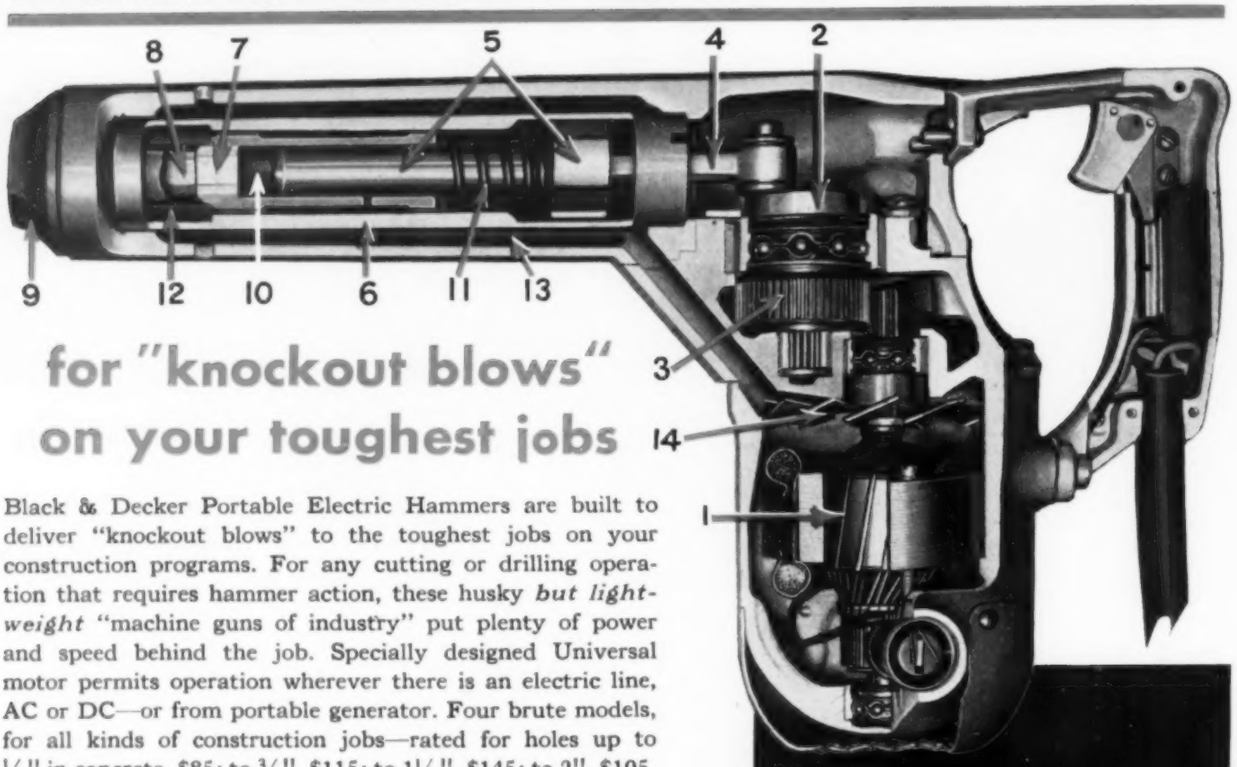

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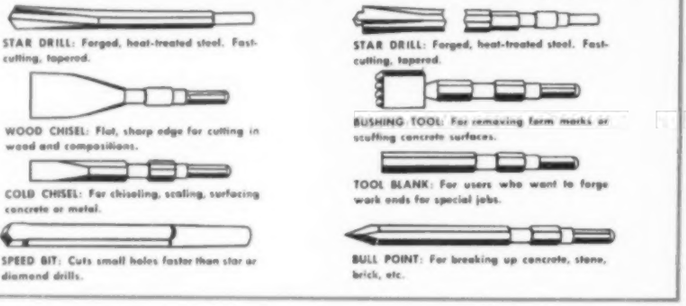

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Universal Motor (1) drives crank (2) through reduction gear train (3). Crank, through the connecting rod (4), drives piston (5), which operates in a metal sleeve (6) and imparts its force to ram (7) which strikes the actual blow on tool shank (8) in nose-piece (9).

Air-cushion (10) is always between piston and ram, and acts as medium through which piston stroke is transferred to the ram. On the up-stroke, this air cushion becomes a vacuum which pulls the ram into position for the blow. On the down-stroke this air-cushion is compressed by piston, drives ram against tool shank. This avoids direct hammering action inside the unit—saves power, reduces wear and frictional heat.

Coil spring (11) is important. Recoil of the ram, after striking tool shank, represents unused energy. This recoil energy is absorbed by the spring and returned to the ram on down-stroke saving more power. Idler (12) keeps ram from hammering when tool shank is not in chuck. Air duct (13) surrounds mechanism; carries cooling flow of air from fan (14).

The BIGGEST JOBS are Yet to Come!

ALL indications point to an after-peace construction program that will top anything this country has ever seen. Even huge war time construction projects will probably be dwarfed if plans now on drafting tables or already completed are carried out. New roads and highways . . . levees and dams for irrigation, flood control and power . . . civilian airports . . . repair and improvement of existing roads . . . these are just a few types of necessary public works that must be started as soon as conditions permit.

But you will have to be ready for these big jobs if you hope to be the successful bidder. Tax dollars must produce more under private contract in peace time, and competition for contracts will be keen. Bids will naturally go to contractors with organizations and equipment to handle the work most efficiently.

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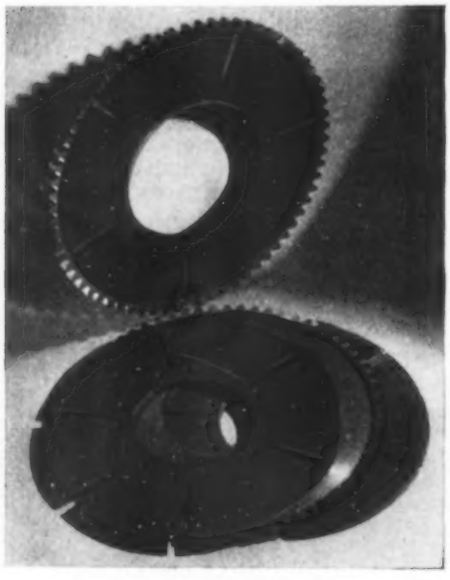
Below: These Velvetouch Bimetallic clutch facings are the type used in the master clutch of the D-4 Caterpillar tractor.



Equipped with a Trackson Traxcavator, this D-4 Caterpillar, owned and operated by Gerl Bros. Excavating Company, really digs into this pile of frozen earth . . . a punishing test for its Velvetouch clutch facing.

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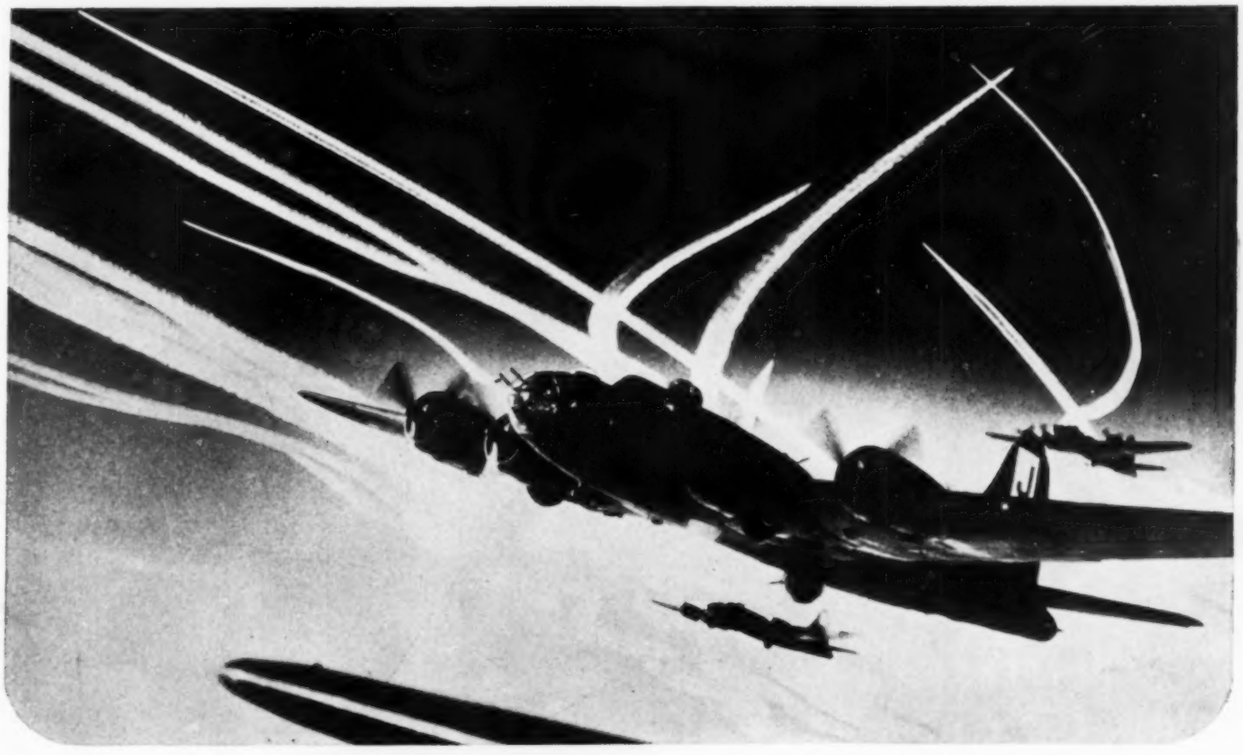

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THE JAEGER MACHINE CO., COLUMBUS 16, OHIO

JAEGER *Engineered* **EQUIPMENT**

"AIR-PLUS" 2-STAGE AIR-COOLED COMPRESSORS, 60 TO 500 FT. — "FLEET-FOOT" CRANE-LOADERS — "SURE PRIME" CENTRIFUGAL PUMPS — "SPEEDLINE" BUILDING MIXERS — "DUAL-MIX" TRUCK MIXERS — "JAEGER" HOISTING ENGINES AND TOWERS — "JAEGER-LAKEWOOD" PAVING EQUIPMENT

Taking the KINKS out of the ALASKA HIGHWAY

with

BUCKEYE CLIPPERS

When the Alaska Highway was originally built, "Hurry" was the slogan. Engineers laid it out along the natural contours of the land—the line of least resistance—to rush the military roadway to completion.

Today with less need for haste, the highway is being streamlined. Hills are being cut away, depressions filled in and curves straightened. It will be 107 miles shorter. On this job, as on the construction of the original highway, Buckeye Clipper convertible shovels are playing important roles.

The success of Buckeye Clippers on this job is evidence of what they can do for you on peace time projects. Under the most severe weather conditions, with little maintenance available, they came through handily. Because of their intelligent design, rugged construction and ease of operation due to "Mevac" finger-tip control, these shovels have made an enviable reputation for greater yardages with less effort.

For post-war operations, write for Buckeye Clipper Bulletin 543. It will show you why Buckeye Clippers should be your choice among ½ and ¾ yard power shovels.

BUCKEYE TRACTION DITCHER CO., Findlay, Ohio

THEY USED TO SET TYPE BY HAND

But now practically all type is rapidly set by machines, making books, newspapers and magazines available in tremendous volumes at low cost. All operations of the Buckeye Clipper are controlled by Mevac vacuum power—the faster, easier and smoother way to run a power shovel or crane. Mevac speeds excavating and material handling as the linotype speeds typesetting.

Built by **Buckeye**

Convertible Shovels Road Wideners Trenchers
Spreaders R-B Power Finegraders Tractor Equipment

"..not one single shut-down with RING-FREE"

Quoting the WILMINGTON COAL MINING CORP., Morris, Illinois: "...through dust, sand and mud in all sorts of weather, operating 24 hours a day in 3 shifts—we have not had one single shut-down as a result of stuck rings or valves, since we adopted RING-FREE. We have proven in this extremely difficult operation that RING-FREE'S ability to penetrate rapidly to tightly fitted valve stems and rings and to resist high temperatures, as well as the sludging effect generally caused by cold weather work, places it far above any lubricant we have had before."

Strippers and other motorized equipment (gasoline and Diesel) give performance you're proud of when lubricated with Macmillan RING-FREE Motor Oil. They deliver more usable power—dependable power—under toughest operating conditions because RING-FREE reduces friction *fast!*

And Macmillan RING-FREE *removes* carbon while your engine runs! Changing to RING-FREE means getting a motor that has to run sweeter as it benefits fully from rapid, thorough penetration. You get high film strength, high heat resistance and long cling from RING-FREE.

Macmillan representatives welcome your trial and comparison of RING-FREE on the basis of complete records of operating performance and economy!

MACMILLAN PETROLEUM CORPORATION

50 W. 50th Street, New York 20 • 624 S. Michigan Avenue, Chicago 5 • 530 W. 6th Street, Los Angeles 14

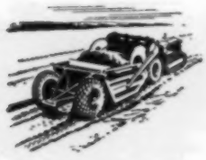
Copyright 1944, Macmillan Petroleum Corp.

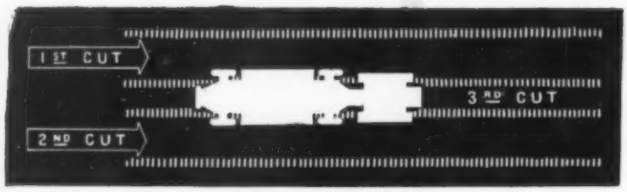
MACMILLAN RING-FREE MOTOR OIL

REDUCES WEAR BY REDUCING FRICTION

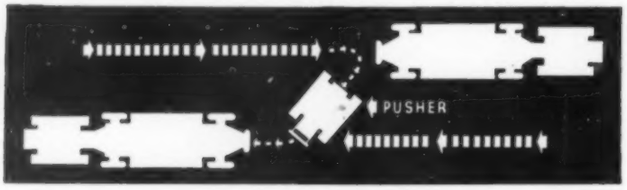
Here's the cheapest, best way to

STRIP TOP SOIL





One way to get bigger heaped loads with less power is to leave a ridge about ½ the width of the cutting edge between successive cuts. Then straddle this ridge on the next trip through, thus pushing a thick slice of material into the center of the scraper.



In loading with a pusher tractor in short pits, it sometimes pays to load in opposite directions and schedule your operations so that the instant your pusher finishes loading one scraper, it can swing around and start loading another. This saves pusher turning and waiting time.

Experienced operators agree that nothing else compares with a tractor-drawn scraper when it comes to removing top soil from large, open areas. This is because a scraper can strip off as much (or as little) top soil as necessary . . . haul it away and stock pile it . . . pick it up later and spread it in smooth, even layers for seeding. Saves time and money, gives you a better finished job and enables you to release less adaptable equipment for other work. To help keep your present LaPlant-Choate equipment in "fighting trim," see your LaPlant-Choate "Caterpillar" distributor—for useful operating ideas, for reliable parts and service. LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa.

WHAT'S COMING?

After the war LaPlant-Choate will be ready with a complete new line of cable and hydraulic operated dozers and scrapers—built exclusively for all sizes of "Caterpillar" track-type and rubber-tired tractors. This new LaPlant-Choate equipment—much of it developed especially for the armed forces and thoroughly proved under the most trying conditions—will offer improvements never before dreamed of in the earth-moving industry. So plan now for the future.

ARMY (E) NAVY

LaPLANT-CHOATE

Earthmoving and Land Clearing Equipment

All-Weather Friend

YOUR "CATERPILLAR" DEALER

WHEN the going gets tough you find who your real friends are. In these war days you can count on the loyal friendship of your "Caterpillar" dealer.

He knows what you're up against. Your problems are his own, for it's his job to make your job more profitable. And he hasn't stopped for a minute.

He has kept his business going — expanded his shop facilities and kept them up to "Caterpillar" standards—the highest in the heavy machinery field. He has kept his factory-trained service men on the job — night and day if necessary — to maintain hard-worked "Caterpillar" Diesel equipment in good working order.

Like a family doctor, he knows the background and the condition of every machine in his territory, and he's in a position to prescribe for it when trouble starts, or *before* it starts.

When the war is over at last, your "Caterpillar" dealer will be even better qualified to serve you. Not only will he have modern, war-proved "Caterpillar" Diesels and genuine parts, but a complete line of matched equipment.

Until that time comes, rely on him to keep your machines in working trim. Proper care is doubly important now, and preventive maintenance will save time, money, breakdowns and critical war materials. Follow your "Caterpillar" dealer's advice about care and lubrication. Have his service men make a regular inspection check-up. Enlist the "Fighting Four" for the duration.

If you must have a new machine and are qualified by your work to get one, your "Caterpillar" dealer will give you sound counsel.

CATERPILLAR TRACTOR CO. • PEORIA, ILL.

THE "FIGHTING FOUR"

INSPECT Look your equipment over frequently. For expert "internal" inspection of operating parts or functions, call in a trained "Caterpillar" service man. Read your Operator's Instruction Book.

LUBRICATE Use the right oil at the right time in the right place and in the right quantity. Keep the oil clean—change before it becomes dirty and deteriorated. Follow the Operator's Instruction Book.

ADJUST Tighten all bolts. Keep fan belt and tracks at proper tension. Read the Operator's Instruction Book. For fuel injection valves and other precision adjustments, let your experienced service-dealer do the work. He'll do it well.

REPLACE Have your service-dealer replace or repair worn bearings, track rollers, pins and bushings, sprockets, cylinder liners, clutch linings. His service helps restore power and extend equipment life. Saves critical materials, too.

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

TO WIN THE WAR: WORK—FIGHT—BUY U. S. WAR BONDS!

DON'T TELL TOJO!

Another

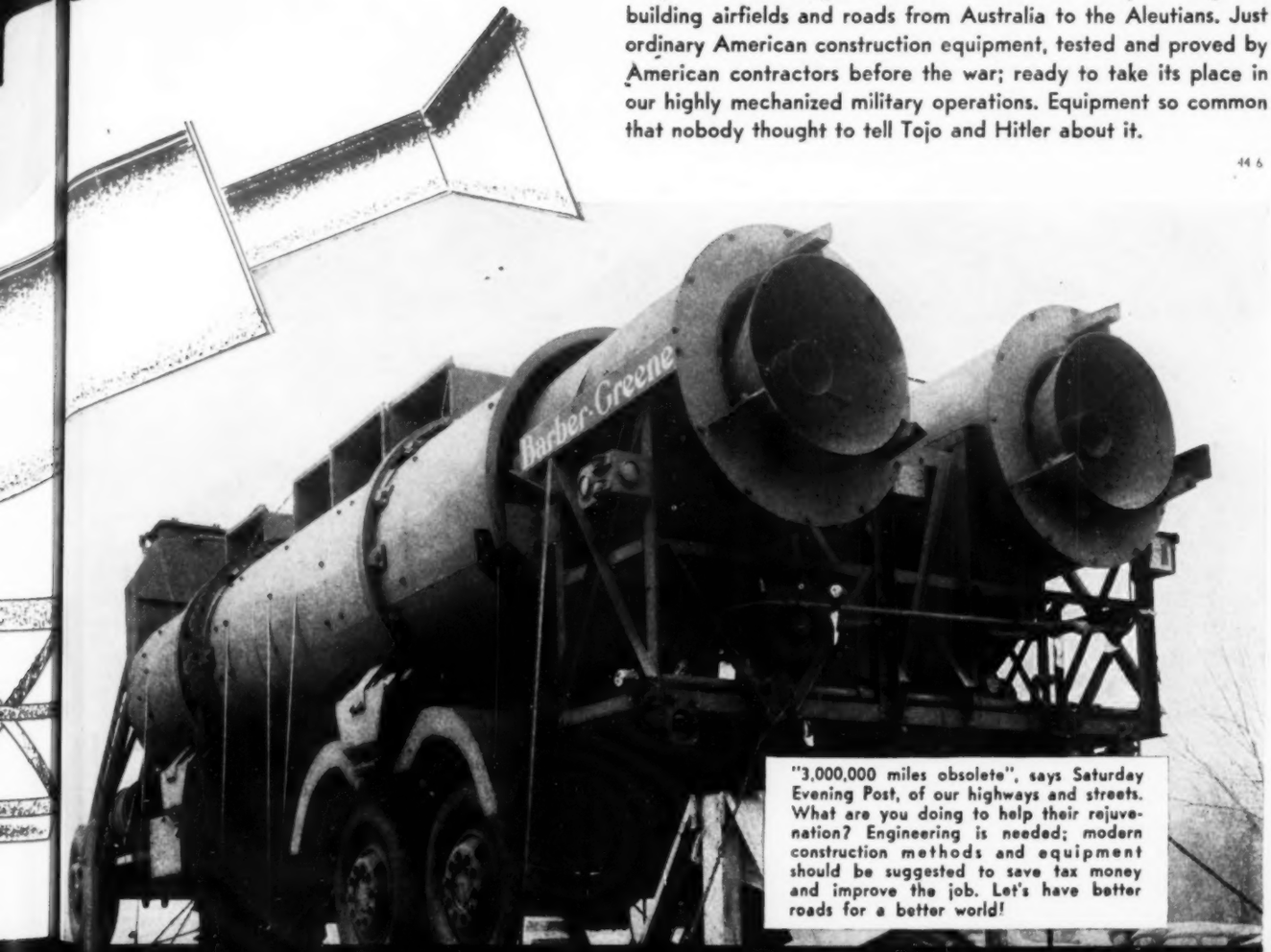
BARBER

AURORA, ILLINOIS, U. S. A.

Secret Weapon

Hitler and Tojo don't know it, but they have caught more hell through American construction equipment and methods than any secret weapon their evil minds can dream up. This is a Barber-Greene Dual Drum Dryer, not a rocket gun—one of the units of the B-G Army Airport Asphalt Plant. These plants built the runways that made possible the successful invasion of Sicily and Italy. They are resurfacing R.A.F. and American runways in England, building airfields and roads from Australia to the Aleutians. Just ordinary American construction equipment, tested and proved by American contractors before the war; ready to take its place in our highly mechanized military operations. Equipment so common that nobody thought to tell Tojo and Hitler about it.

44 6



"3,000,000 miles obsolete", says Saturday Evening Post, of our highways and streets. What are you doing to help their rejuvenation? Engineering is needed; modern construction methods and equipment should be suggested to save tax money and improve the job. Let's have better roads for a better world!

BARBER-GREENE

AURORA, ILLINOIS, U. S. A.

U. S. CONSTRUCTION MIRACLE: Over 21 billion dollars of war construction completed in 1942 and '43—whole cities and towns delivered "in packages." Shell supplied 449 contractors with industrial lubricants.

"Shall I wrap it up?"

FACED with the most gigantic job in its history, the Construction Industry "virtually overnight wrapped up and delivered" vast war plants . . . Army and Navy camps for millions of men . . . complete towns and cities to house war workers.

Bulldozers, cranes, dredges, trucks, tractors, shovels working full time, overtime, day and night were pushed to the limit. With new machines almost impossible to obtain, proper lubrication was of the utmost importance.

Shell Industrial and Automotive Lubricants, under these severe operating conditions, performed superbly. On many projects Shell lubricants were used exclusively . . . on many more Shell supplied 60, 70, or 80% of the vital lubricants:

Millions of gallons of Shell products—including Industrial Lubricants—were used in building one of the Navy's largest Air Stations: hundreds of buildings, vast runways, a seaplane base, roads, railroads—all were delivered complete in only a year-and-a-day.

A ten-mile-long powder plant in the Pacific Northwest was completed months ahead of schedule, machines run at capacity on Shell Industrial Lubricants.

An important excavation project in the Midwest was being slowed up because of faulty bearing lubrication—a Shell Lubricant, Talpex, solved the problem.

As production goes all-out for victory, proper lubrication becomes even more vital. Yesterday's solution is seldom good enough for today.

At the "University of Petroleum," Shell's research laboratories, lubricants are constantly being improved. Shell Lubrication Engineers apply these improvements in the field.

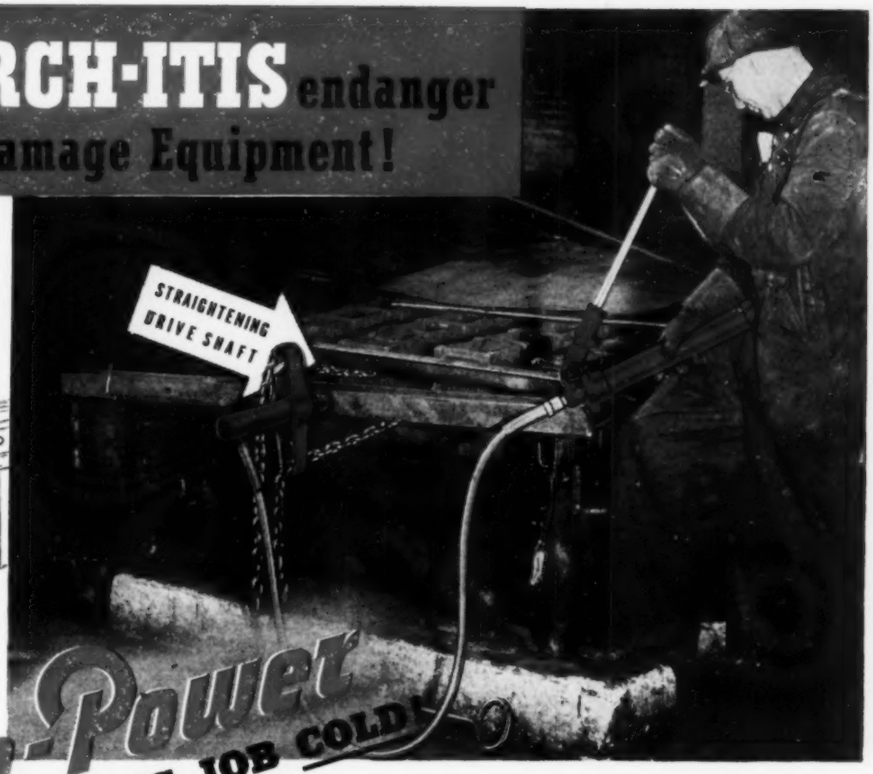
Make sure the machines in your plant get the benefit of all that's new in lubrication. Call the Shell Lubrication Engineer.

SHELL

Leaders in War Production rely on

SHELL INDUSTRIAL LUBRICANTS

Don't Let TORCH-ITIS endanger Men and Damage Equipment!



LET Porto-Power DO THE STRAIGHTENING JOB COLD!

APPLY TONS OF POWER AT THE RIGHT SPOT - - - *Safely!*

TONS of irresistible hydraulic power — as gentle as a kitten — controlled with split-hair accuracy — applied at the right spot safely — *that's Blackhawk Porto-Power!*

Power to bend, straighten, pull, push, lift, lower, spread and press!

No need to use heat! Eliminate open flame *"torch-itis"* that endangers men and takes the strength from metals. No need for dangerous, damaging *"sledge-hammer-itis"* and *"crowbar-itis"* methods!

Porto-Power straightens shafts, beams, pipe and heavy parts — pulls gears and wheels — presses and separates dies — lifts and lowers heavy machines — does 1001 tough jobs and does them easily, safely, quickly!

Because it accomplishes miracles in maintenance and manufacture — in production plants, shipyards, construction companies and repair and service organizations — Porto-Power is fast becoming indispensable standard hydraulic service equipment!

Write Blackhawk or call your industrial supply distributor for complete information on Porto-Power in 7, 10, 20, and 50-ton capacities.

A Product of **BLACKHAWK MFG. CO.**
Department P2344 **Milwaukee 1, Wisconsin**

ARMY NAVY

BLACKHAWK

Hydraulic Equipment — Wrenches

BLACKHAWK MFG. COMPANY
Dept. P2344, Milwaukee 1, Wisconsin

Send catalog on Porto-Power and complete wartime Hydraulic Equipment line.

Name _____

Firm _____

Address _____

How Simplified Wire Rope Practice Benefits the Consumer

Simplified Practice for wire rope—as defined in recommendation R198-43 of the National Bureau of Standards—has been in effect since February 15, 1943. The industry has whole-heartedly accepted this reduction in sizes, grades and varieties of wire rope.

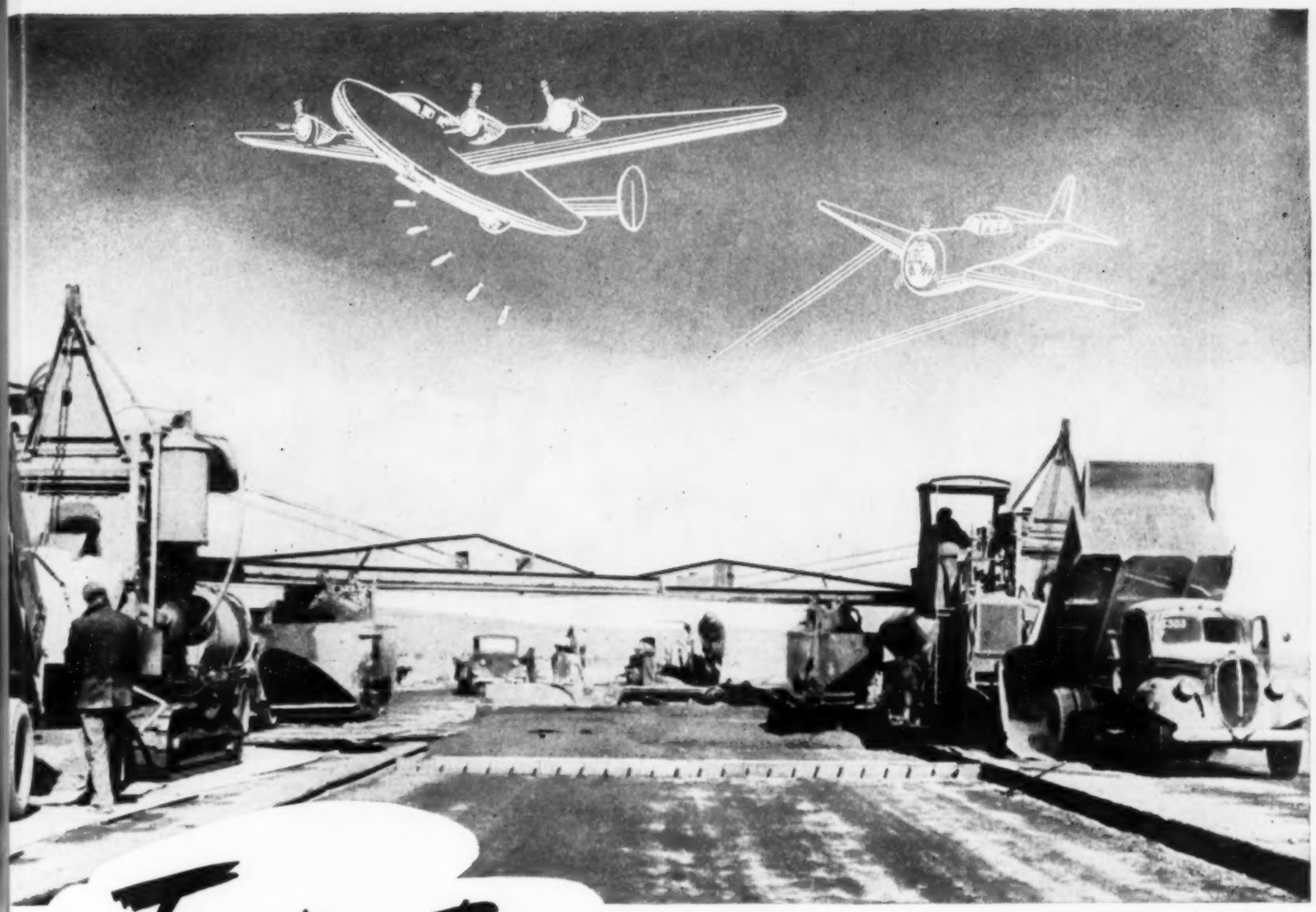
The overall reduction is from 973 items to 643, or 33.9 per cent. In the four rope constructions which represent the industry's major tonnage, the reduction is from 352 items to 182, or 48 per cent. We think that simplified practice is proving its worth.

To the consumer, there are obvious benefits in simplification. In nearly all cases he will find a rope available that fits his needs, and in addition he will get quicker deliveries and better service.

So we say to wire rope users: Stick to simplified practice ropes. We'll be glad to help you solve your problems. And, of course, simplified practice does not preclude manufacture and sale of special-purpose ropes, such as those listed in our new Wire Rope Catalogue, No. 165. Write to Bethlehem Steel Co., Bethlehem, Pa., for a copy today.

THESE ARE THE 20 STANDARD TYPES OF WIRE ROPE LISTED IN VARIOUS GRADES IN R198-43

- 6 x 7 wire rope
- 6 x 19 wire rope
- 8 x 19 wire rope
- 6 x 37 wire rope
- 6 x 19 elevator rope
- 8 x 19 elevator rope
- 5 x 19 marline clad rope
- 18 x 7 non-rotating rope
- 6 x 12 galvanized running rope and hawsers
- 6 x 24 galvanized steel mooring lines and hawsers
- 6 x 37 galvanized steel hawsers
- 6 x 25 type "B" flattened strand wire rope
- 6 x 30 type "G" flattened strand wire rope
- 6 x 8 type "D" flattened strand wire rope
- 6 x 6 x 7 tiller rope
- 6 x 7 iron, bright, and galvanized sash cords
- 9 x 4 galvanized mast arm rope
- 6 x 19 marline clad grain-shovel rope flat rope
- 6 x 7 galvanized iron rigging and guy rope



Foote steps to a Paving Record

Under the urgency of war, Multi Foote Pavers, leaders in peacetime production, are setting new records for high speed paving, for rugged dependability, and for cooperation. Recently on a rush job in the Nevada Desert two contractors teamed up a pair of 34E Multi Foote Pavers to pour a record of 111,406 cu. yds. of 9 in. slab in a period of 27 days—ahead of schedule, working against sand, wind, cold, and other tough conditions. An average of 4,000 cu. yds. per day was maintained. In one 24-hr. period, 6,890 cu. yds. were placed!

Part of the time the pavers worked side by side as shown. At other times they were separated by more than a mile, pouring at intersections, turning points, and spots provided for warming up. Adaptability and cooperation got the job done. Contractors were J. A. Carson Co. and N. M. Ball Sons. The field was being rebuilt to speed up training of Air Force bombardiers and gunners.

In planning for postwar construction, consider the importance of selecting equipment now that will enable you to meet all competition — that will not be obsolete after the firing ceases, that will provide big production, dependable service free of excessive repair charges and delays, that will show low costs. Multi Foote Pavers led the field before the war. Multi Foote Pavers are hanging up new records in rush construction now. Multi Foote Pavers will be available, adaptable, dependable and economical when the postwar battle for business begins. Make sure you stay competitive by getting the Paver which is still setting records.

The World's Largest Exclusive Manufacturers of Concrete and Black Top Pavers.

THE FOOTE COMPANY, INC.
NUNDA • NEW YORK

Multi Foote Pavers Conform to A. G. C. Standards and Specifications.

ARMY (E) NAVY

MULTI FOOTE
CONCRETE PAVERS

A. LESCHEN & SONS ROPE CO.
ST. LOUIS
PREFORMED
LESCHEN
"HERCULES"
REG. U.S. PAT. OFF.
RED STRAND
WIRE ROPE
Durability
THE extra Durability of Preformed "HERCULES" (Red-Strand) Wire Rope is today helping to speed up the war effort in many battle stations—beginning with production of raw materials and following through to where the actual fighting is being done.
Tomorrow this dependable and long lasting wire rope will be available for all peace-time operations. It will help build new highways, new homes and the thousand and one other things which are the normal needs of free Americans. Let us hasten that day by doing our utmost now so that never again will there be too little . . . too late.
Let the
RED-STRAND
Be Your Guide
in
YOUR POST WAR
PLANNING

MADE ONLY BY

A. LESCHEN & SONS ROPE CO.

WIRE ROPE MAKERS — ESTABLISHED 1857

5909 KENNERLY AVENUE — ST. LOUIS, MISSOURI, U. S. A.

NEW YORK . . . 90 West Street
CHICAGO . . 810 W. Washington Blvd.
DENVER . . . 1554 Wazee Street

SAN FRANCISCO . . 520 Fourth Street
PORTLAND . . 914 N. W. 14th Avenue
SEATTLE . . 3410 First Avenue South

Out of the Pacific Come

NEW WAYS TO CUT YOUR CONSTRUCTION COSTS!

OUT where the heat's on, they're hewing tropical islands into stepping stones to Tokio. It's a tough job, 24 hours a day, 7 days a week. Yet in the doing American ingenuity is finding new ways to cut construction time and costs that *you* can put to good use right now!

From the word "go" the job called for continuous production from every machine. In this battle lost minutes could mean lost men. These machines required the dependable lubrication provided by modern maintenance centers. Such facilities were usually located far from them.

So they brought power lubrication *to* the machines via modern Alemite Portable Service Stations! The savings in machines, man hours and lubricants were so outstanding that, today, the practice is followed on scores of similar jobs.

FACTS FROM THE PACIFIC THAT YOU CAN PROFIT BY!

During an 18 month check, wear on track rollers on "cats" has been reduced by 32% over hand-type greasing.

Due to "barrel to bearing" dispensing, oil and grease consumption has been reduced by 19%.

The equipment serviced includes tractors, bulldozers, caterpillars, shovels, mobile cranes, light plants, trucks, carry-alls, and other machines too numerous to mention.

In one Pacific area, comprising a number of projects, 43 Alemite Portable Service Stations are in continual use.

The equipment is mounted on trucks ranging from one ton to seven ton capacity.

The Alemite Portable equipment includes high and low pressure pumps, gas-driven air-compressors, reels and 50 feet of air hose and light plants for night operation.

All units were assembled on the job according to plans produced by Alemite.

In the Pacific, the jobs had to be done the hard way. Yet here's conclusive proof of savings in manpower, time and machines—a cutting of costs all down the line!

FREE! New catalog illustrating and describing Alemite Portable Service Stations. Write for your copy today!

How the Alemite Portable Service Station Saves Time, Machines and Money!

CONSTRUCTION projects on the home front frequently require irreplaceable equipment to work without let-up far from maintenance centers. Breakdowns for lack of accurate lubrication are plenty costly in lost time, manpower and machines!

That's why more and more contractors are protecting their vital equipment with Alemite Portable Service Stations. They meet any lubrication need, anywhere, quickly and dependably. And it's a far easier method, saves many man-hours . . . helps get jobs done faster!

The Alemite Portable Service Station is a complete power mobile lubrication department—includes high and low pressure Alemite Barrel pumps, Alemite Motor Oil dispenser, hose reels, and gas engine equipped air-compressor.

For complete information on both standard and custom built Alemite Portable Service Station models . . . for proof of how this equipment *can actually pay for itself in days*, send for your FREE copy of the new Alemite Portable Service Station catalog.

ALEMITE

First in Modern Lubrication

1840 Diversey Parkway, Chicago, Ill. • Belleville, Ontario

Another Product of STEWART WARNER

"The Moretrench Wellpoint System did a splendid job...way beyond our expectations"

(from a contractor's letter)

Bring your wet ones to us — we'll save you time and money and turn them out dry!

• Contractors expect a lot from Moretrench—and get it too!
1. An Accurate Estimate 2. Quick and Efficient Service
3. A-1 Equipment properly installed—and these
Guarantee a Bone Dry job in short order at low cost.

MORETRENCH CORPORATION

90 WEST STREET, NEW YORK 6

CHICAGO, ILL. **ROCKAWAY, NEW JERSEY** **NEW ORLEANS, LA.**

IT'S A FINE PIECE OF THE PIE

- if your machinery is right!

be Sure it's Cedarapids — Built by IOWA

No matter who you talk to — no matter what combination you use, the figures for the future of construction add up to big ones.

All construction begins with aggregate, and considering that a part of the percentage of the "plant and equipment" figure should be included with "aggregate quarrying," over 8% of the highway dollar goes into aggregate production.

Aggregate is basic! Not another machine on the job can turn a wheel until the aggregate is available! Aggregate machinery must be dependable, and must deliver at low cost.

It is machine dependability and high production at low cost that has made Iowa the Headquarters for aggregate producing equipment. Check the names of Iowa owners! Check the output records! Check the number of machines Iowa ships as compared with others! These are the things that prove that big names, big jobs and "Iowa" go together. These are the things that guarantee that Iowa equipment will give you more than you ask on your future contracts.

It is a nice piece of pie, and there will be profit in it if you are Iowa-equipped. We'll be glad to help you with your plans.

THE IOWA LINE
of Material Handling Equipment
Includes

ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS — STEEL BINS
BUCKET ELEVATORS
VIBRATOR AND REVOLVING SCREENS
STRAIGHT LINE ROCK AND GRAVEL PLANTS
FEEDERS — TRAPS
PORTABLE PLACER MACHINES
PORTABLE POWER CONVEYORS
PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS
TRAVELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS

WHEN ENGINEERS IN "CIVVIES" MUST FIGHT ON C RATIONS

Not all the foxholes in this war are on active global fronts. Thousands of miles behind the lines, all-out offensives are being mounted and maintained by engineers in "civvies", to assure ample production of the materiel so vital to our boys over there.

Only the extra speed provided by modern equipment enables these home front fighters to overcome deficiencies in manpower and meet time-limit challenges.

Pictured here is a versatile, Thermoid-equipped unit manufactured by the Austin-Western Company, who report: "To what extent these machines are aiding in the 'all-out' drive cannot very well be revealed; but their liberal use in many quarters is a well-established fact. Only a small crew is needed to 'man all stations', even on the biggest units; and you can rely on these sturdy plants for profits that do not shrink after maintenance figures are added up, and for production that does not lag when rigid specifications must be met."

You, too, will find that Thermoid Products are *designed* for unusual service—and built to *deliver* that service in use. It's good business to do business with Thermoid.

Thermoid Rubber

DIVISION OF THERMOID CO.
TRENTON, NEW JERSEY

THE THERMOID LINE INCLUDES: Transmission Belting • F.H.P. and Multiple V-Belts and Drives • Conveyor Belting • Elevator Belting • Sheet Packings • Wrapped and Molded Hose • Industrial Brake Linings and Friction Products • Molded Hard Rubber and Plastic Products.

Don't put it off 'til tomorrow . . . BUY MORE WAR BONDS TODAY!

TYPICAL DIESEL LUBRICATION PROBLEMS:

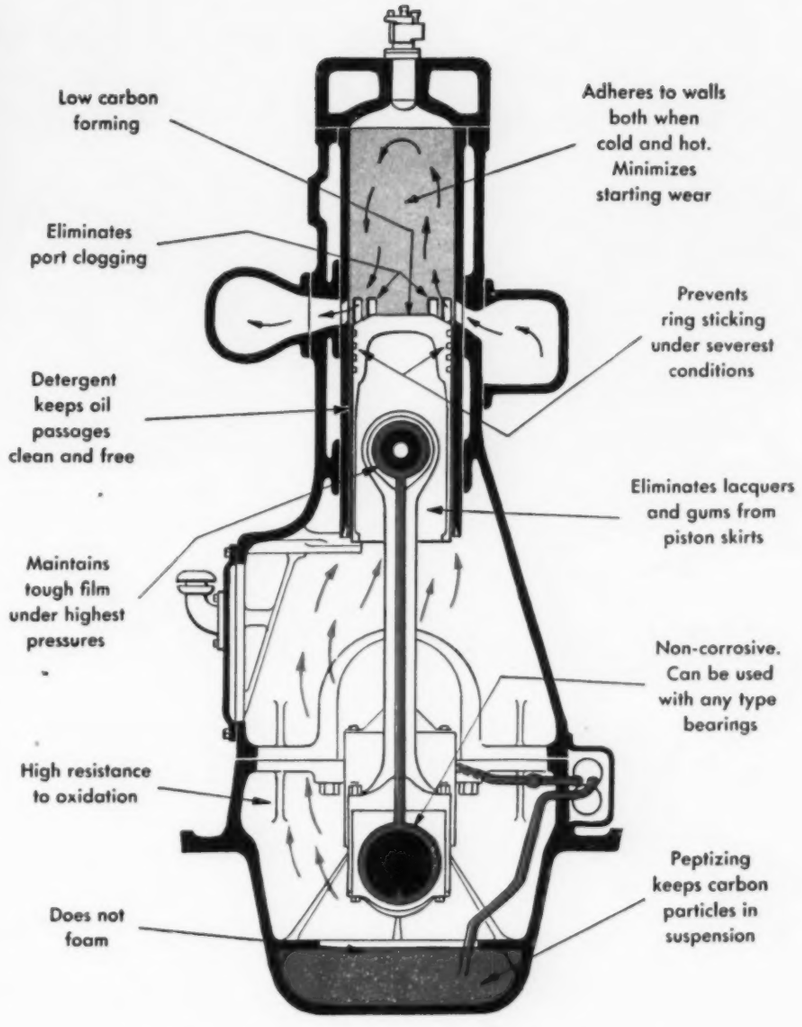
1. Port Clogging

The plugging of intake and exhaust ports is frequently a factor in the operation of two-cycle Diesel engines.

Port clogging results from the combination of fuel soot with the residues of oxidized lubricating oil, which acts as a binder to plug the port openings. This clogging, of course, results in a sharp drop in efficiency.

In simplified form, the deterioration of lubricating oil in an engine involves a combination of oxygen and oil at high temperatures. As the oil continues to absorb more and more oxygen, acids called "oxyacids" are produced. These oxyacids tend to polymerize or form very large, oil insoluble molecules. These form the binder for the deposits on intake and exhaust ports.

The problem, then, of eliminating these deposits may be solved by the use of a lubricating oil properly compounded to prevent it becoming a binder. RPM DELO accomplishes this in four separate ways.


Low carbon forming
Adheres to walls both when cold and hot. Minimizes starting wear
Eliminates port clogging
Prevents ring sticking under severest conditions
Detergent keeps oil passages clean and free
Eliminates lacquers and gums from piston skirts
Maintains tough film under highest pressures
Non-corrosive. Can be used with any type bearings
High resistance to oxidation
Peptizing keeps carbon particles in suspension
Does not foam

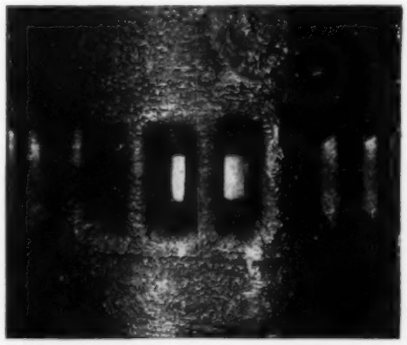
Diagrammatic sketch of 2-cycle Diesel, showing the typical location of intake and exhaust ports and the advantages obtained from the use of RPM DELO.

1. RPM DELO is manufactured from a carefully selected base oil containing natural inhibitors highly resistant to oxygen. It contains no heavy residues which may be left behind to act as a binder for the fuel soot.

2. RPM DELO contains a powerful oxidation inhibitor, which greatly reduces the rate at which the oil absorbs oxygen.

3. RPM DELO has chemical detergent properties. The compounding material reacts with the oxyacids to render them essentially inert so that they are no longer able to polymerize to form gums and lacquers.

4. RPM DELO has peptizing properties which enable it to maintain soot and oxidation products in suspension in minute particles. This prevents these materials from settling from the oil and forming engine deposits.



Unretouched photo shows air ports from 1000 h.p., 12-cyl., 2-cycle Diesel streamliner locomotive after being lubricated with RPM DELO for 127,590 miles. This is typical of absence of port clogging experienced when RPM DELO is used.

The elimination of port clogging, is, of course, only one of the valuable properties of RPM DELO. It also minimizes ring and cylinder wear, eliminates ring sticking, prevents excessive deposits on rings and will not corrode bearings.

RPM DELO has world-wide distribution and is marketed under the following names: RPM DELO, Caltex RPM DELO, Kyso RPM DELO, Signal RPM DELO, Sohio RPM DELO, and Imperial-RPM DELO (concentrate).

RPM DELO

STANDARD OF CALIFORNIA

REMEMBER THE MAINE..

POTATO CROP OF 1943

You can safely bet your family's ration books that Maine farmers will remember it with pride—and for many years to come! Fighting food . . . spuds by the millions of barrels! A Victory crop so enormous that unprecedented measures had to be taken to harvest it and keep it secure against Winter. And mister, *THAT'S WHERE GENERAL EXCAVATOR SHOVELS ENTERED THE PICTURE IN A BIG WAY.*

General power shovels helped to revive the old method of pit storage (huge pits dug in the earth) in order to save the crop. This was necessary because there were millions of bushels yet to store after every available foot of inside storage space was taken. The crop was saved . . . another vital Victory job completed! We hope as Maine goes, so will go the rations!

For post-Victory performance—ride with General and Osgood! Their post-war values are revealed by their war service—today!

The OSGOOD COMPANY
Sizes: ½ to 2½ Cu. Yd.
Diesel - Oil - Gas - Electric
Associated with
The GENERAL EXCAVATOR CO.

The HERCULES COMPANY
HERCULES *IRONEROLLERS*
6 to 12 Tons
Diesel or Gasoline
Associated with
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GENERAL

Sizes:
⅜-½-⅝-¾ Cu. Yd.
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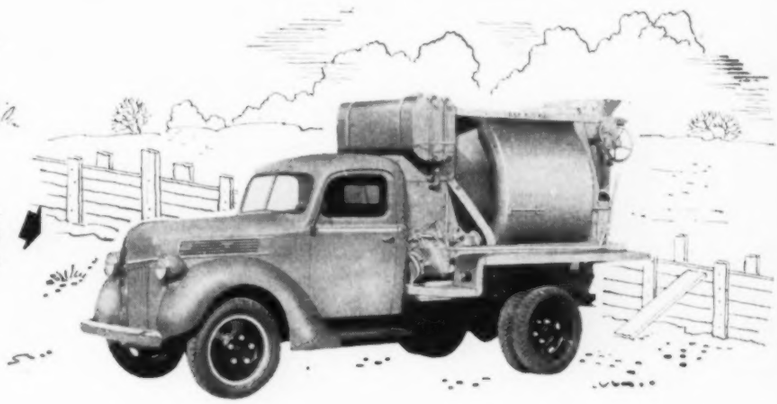
OSGOOD MARION OHIO U.S.A. GENERAL HERCULES

SHOVELS
DRAGLINES - CRANES
Crawler & Wheel Mounted

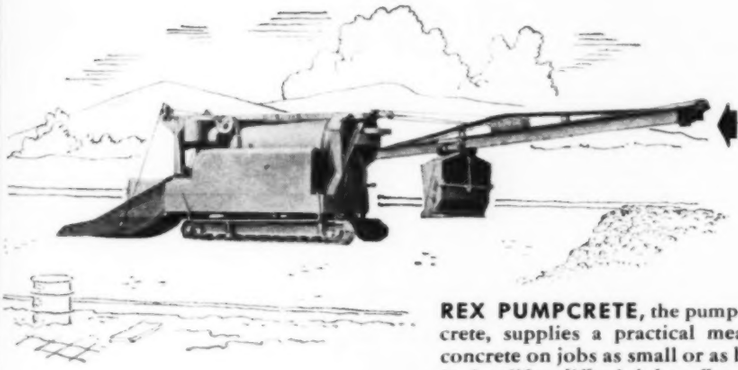
THE GENERAL EXCAVATOR COMPANY, Marion, Ohio

FOR EFFICIENT-ECONOMICAL CONCRETE CONSTRUCTION AND MOVING OF WATER

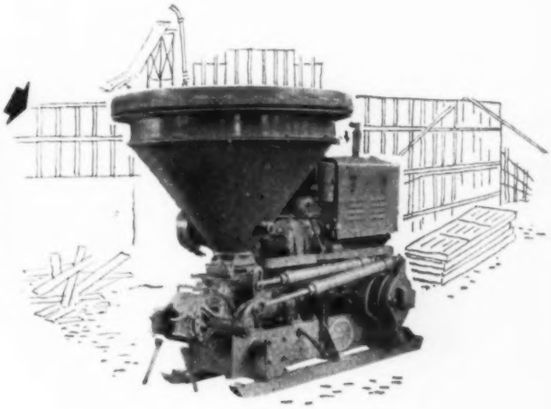
REX MIXERS are leaders at the job of producing high quality concrete for everything from basements to bridges . . . factories to homes. Soundly designed and ruggedly built for top performance, they speed up mixing and placing concrete wherever they are used. Available in 3½S, 5S, 7S, 10S, 14S and 28S sizes.



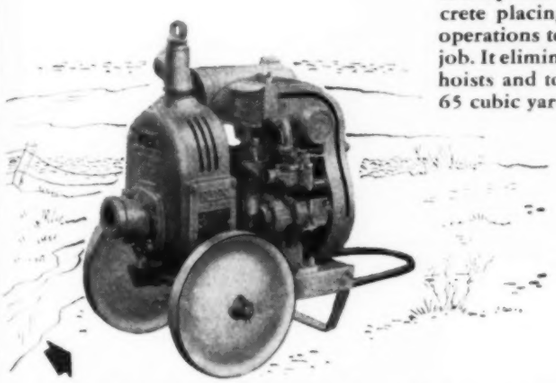
REX MOTO-MIXERS are proved superior by actual job performance and operator preference. Simplicity and ease of operation result in most efficient and economical mixing and placing of specification concrete. Rex Moto-Mixers are available in all standard sizes.



THE REX 34E DOUBLE DRUM PAVER has an unusual performance record for high volume production and smoothness of handling. Operation is controlled by the Rex Mechanical Man, resulting in the fastest possible mixing cycle. The Rex Paver is by far the most modern and efficient paver built.



REX PUMPCRETE, the pump that pumps concrete, supplies a practical means of pumping concrete on jobs as small or as big as they come. It simplifies difficult jobs, effects savings in concrete placing costs and better co-ordinates all operations to permit faster completion of entire job. It eliminates the need for buggy runs, chutes, hoists and towers. Capacities range from 15 to 65 cubic yards per hour.



REX SPEED PRIME PUMPS are high capacity, self-priming, centrifugal pumps used for general dewatering and supply purposes for construction jobs. They are sturdily built, with capacities ranging from 3000 up to 125,000 gallons per hour. Gasoline or electric power operated.

Rex Engineers are specialists in the design, manufacture and application of equipment for mixing, hauling and placing of concrete and the moving of water. Write for illustrated booklets containing the complete facts and engineering data. Address Chain Belt Company, 1664 West Bruce Street, Milwaukee 14, Wisconsin.

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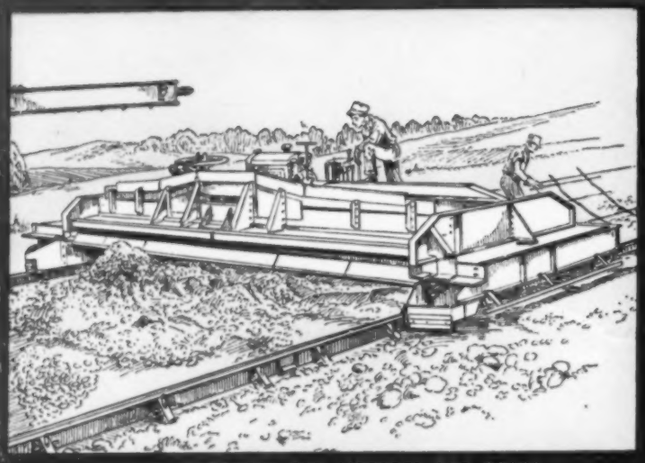
REX

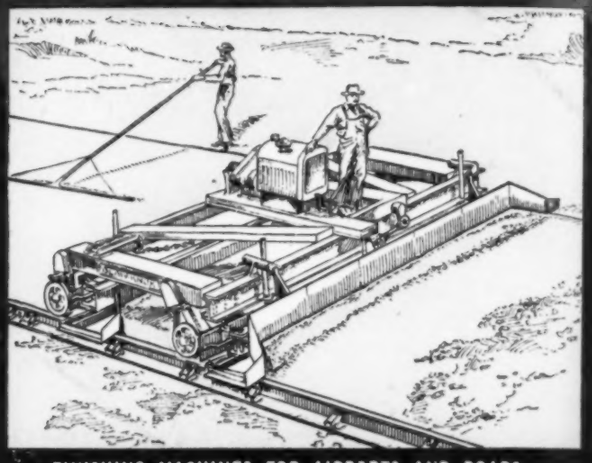
CONSTRUCTION MACHINERY

PUMPS PAVERS PUMPCRETES MOTO-MIXERS MIXERS

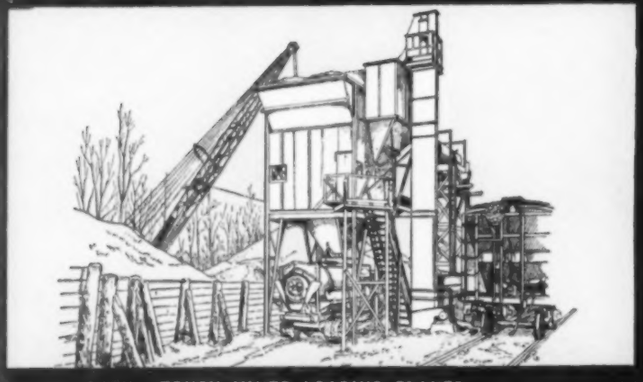
BLAW-KNOX *has the answers to*



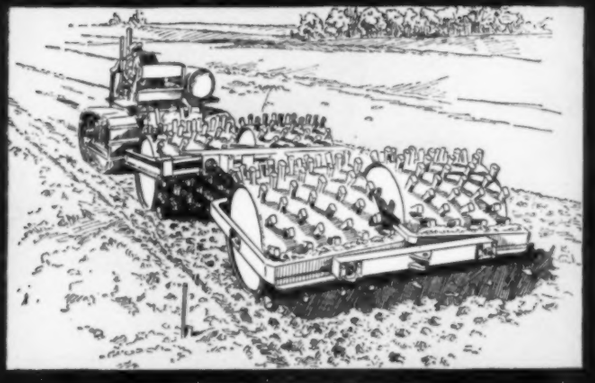
PAVING SPREADERS FOR AIRPORTS AND ROADS



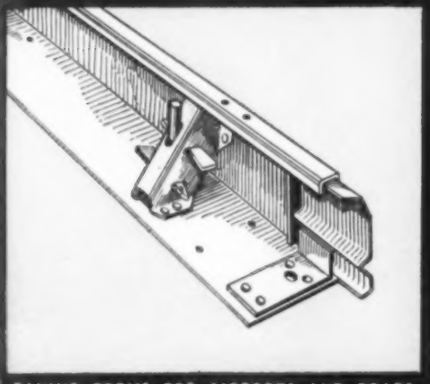
FINISHING MACHINES FOR AIRPORTS AND ROADS



TRUCK MIXER LOADING PLANTS



SHEEPSFOOT TAMPING ROLLERS



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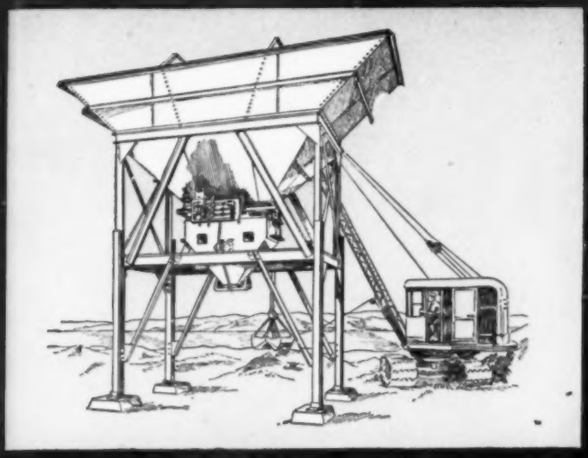
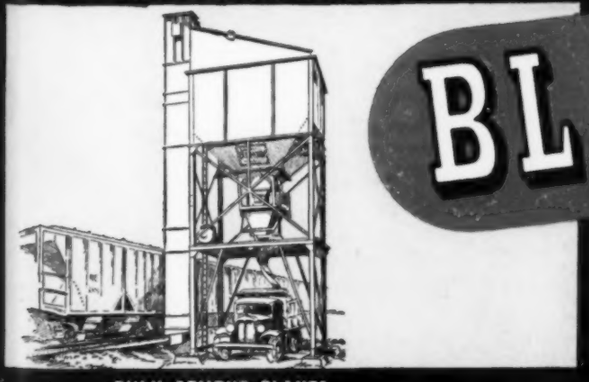


AGGREGATE BATCHING PLANTS

STEEL FORMS
FOR GENERAL CONCRETE CONSTRUCTION



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That unbeatable combination of *correct design, rugged construction* and *assured performance* has made Blaw-Knox equipment first choice of construction men who have a reputation for getting things done in a hurry...You'll find this trouble-free equipment hard at work building roads, airports and general concrete construction all over the world.

You can depend on your nearest Blaw-Knox Distributor to handle your inquiry promptly and efficiently.

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He reads tires

A typical example of B. F. Goodrich development in rubber

THIS is a tire "detective" at work.

By education and experience he is trained to read tires almost as easily as you read a book.

From his expert knowledge of rubber he can tell you many things about the care a tire has enjoyed, or the abuses it has suffered—just by looking at it. He *knows* when a tire has been improperly inflated, mismatched, overloaded, or driven too fast. Diagnosing the causes of premature tire failures is his business. Saving you money on tires is his job.

Unfortunately there are far too few of these men who are trained to read tires. But by organizing a select group of them into a *scientific* tire-saving team. The B. F. Goodrich Company has been able to make their services available to hundreds of truck fleets with from 10 to 3200 vehicles each. We call this team the "B. F. Goodrich Tire Conservation Service".

Under the comprehensive, point-by-point program included in this service, factory-trained tire specialists take over the complete supervision of your tire maintenance. They apply to your tires the experience they have gained in handling literally thousands of equipment units; eliminate the causes of most premature tire failures; keep a constant check on your operations; and make mileage-stretching recommendations that save you money—sometimes overnight.

Fleet owners who are already using this low-cost service report savings up to 25%. Many of them are amazed at the results. "It saves far more than it costs!" and "The number of failures has been reduced 60%!" are typical of their comments.

Only a few trained men are available to take over a limited number of additional fleets in certain areas. If you would like to know how this tire conservation plan can be applied to your construction equipment, write the *Tire Conservation Department, The B. F. Goodrich Co., Akron, O.*

B.F. Goodrich
Truck & Bus Tires

ANNOUNCING

a new P&H truck crane

A Modern Mobile Unit...

Speeds a Variety of Work

In this new truck crane, P&H presents a completely new conception of modern materials handling equipment. It's designed for quick and easy mobility with standard road-width clearances — easier to handle in traffic.

Outstanding features include:

- Lowest center of gravity increases stability — enables you to handle a wider range of work.
- No sway at boom point — P&H's weave-proof carrier frame solves this problem.
- Complete hydraulic control with planetary lowering mechanism — gives you smooth accuracy for "inching" loads.
- Triple-safe, planetary boom hoist gives positive protection against accidents — the boom *can't* fall suddenly.
- Tractive power is transmitted through double-drive axles in tandem . . . greater tugging power, with 10 speeds forward and 2 reverse.

For handling structural steels, concrete, and other materials to and from high levels, this unit can be easily equipped to work with hook, clamshell, magnet, etc. Rugged, powerful, modern in every respect, this new P&H truck crane offers more operating advantages than you have ever known in a unit of this type. Write for complete information.

General Offices: 4494 West National Ave., Milwaukee 14, Wis.

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FACE LIFTING

WHETHER "lifting" the face of a mountain, boring a tunnel, building Army and Navy bases or airport runways, one of a contractor's first considerations is Compressed Air.

Air compressor operators everywhere are getting continued trouble-free performance by lubricating with *Texaco Alcaid, Algol* or *Ursa Oils.*

Texaco Alcaid, Algol or *Ursa Oils* assure wide-opening, tight-closing valves, free piston rings, open ports, clear lines. Their use assures maximum service life between overhauls, fewer repairs and replacements.

So effective have Texaco lubricants proved that they are definitely preferred in many fields, a few of which are on the right.

Texaco Lubrication Engineering Service is available to you through more than 2300 Texaco distributing points in the 48 States. The Texas Company, 135 East 42nd St., New York 17, N. Y.

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★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

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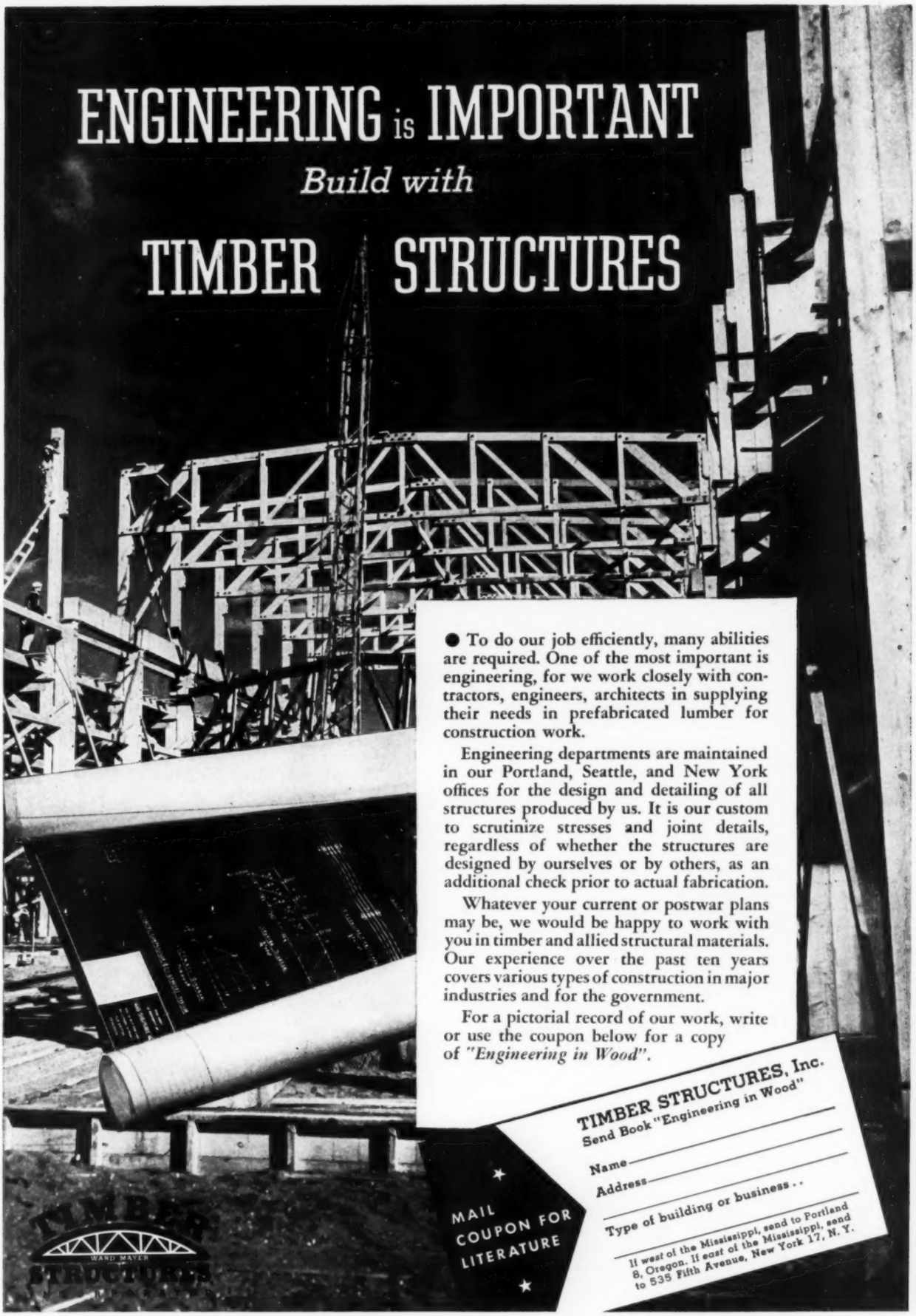
FOR ALL CONTRACTORS' EQUIPMENT

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY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PATHFINDERS OF THE DIESEL ERA

The original Burlington Zephyr which inaugurated a new era in American transportation history in 1934. After more than 1,650,000 miles it still is assigned to its daily round trip of 465 miles between Lincoln and McCook, Nebraska.

Latest of the illustrious descendants of the original Zephyr—one of the sixteen 5400-horsepower General Motors Freight Locomotives being put into wartime service by the Burlington Lines.

IT is just ten years since the famous Burlington Zephyr introduced new ideas in railroad travel. It was the world's first Diesel-powered streamlined train. Its power plant was General Motors Diesel. Today hundreds of General Motors Diesel Locomotives are hauling passengers and freight on 75 American railroads. They operate many millions of miles annually with astounding dependability and economy. Day by day additional GM Locomotives are entering that honored field of more than one million miles of operation. Every day brings new records of performance. And this performance, highlighted by its invaluable contribution to the astonishing war record of the railroads, is providing a glimpse of the greater day of railroading which lies ahead.

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Photo by Gene Smith-Parade

This might have been your NEW crane, but . . . .

Your present equipment, working 'round-the-clock will last longer and continue to perform efficiently if these common-sense rules are followed:

- **insure proper regular lubrication**
- **provide daily inspection to detect troubles while they are still small**
- **make adjustments when needed—don't wait**
- **tighten loose bolts and nuts**
- **keep fuel, lubricants and water clean**
- **remove clutch and brake bands and clean lining with good grade of clear gasoline**
- **change cables end-for-end to increase life of wire rope**
- **plan work to favor machine**
- **inspect engine regularly—flush radiator when dirty**
- **always give model and serial numbers when ordering repairs**
- **contact your BAY CITY distributor for parts and service.**

here again BAY CITY has gone to war to help the Navy . . .

Some of these days, when the war is won, the nice easy control, the smooth operation, and the excess power which has always been characteristic with BAY CITY equipment will again be available for civilian needs. Just as this "65" handles a Navy Scout with great precision, so too, will it take care of your material handling and steel erecting requirements. Right now all production facilities are devoted to military services. We would like however to send you catalogs and specifications on crawler or pneumatic-tire mounted shovels, cranes or draglines so you will learn why BAY CITY offers such low-cost, dependable performance. Write Bay City Shovels, Inc., Bay City, Mich.

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12 Sizes
⅜ to 1½ Yard
Also truck mounted shovels and cranes

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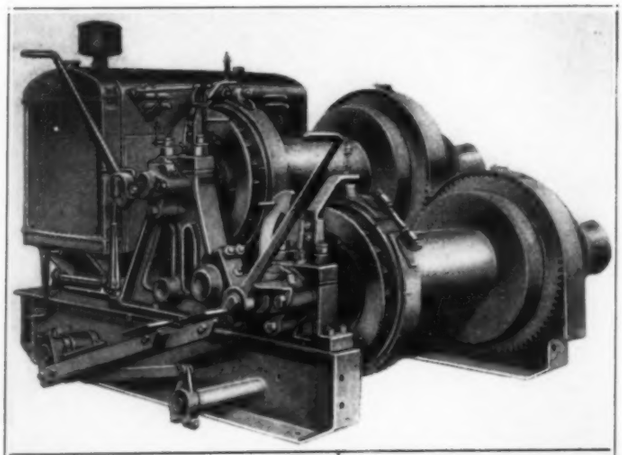
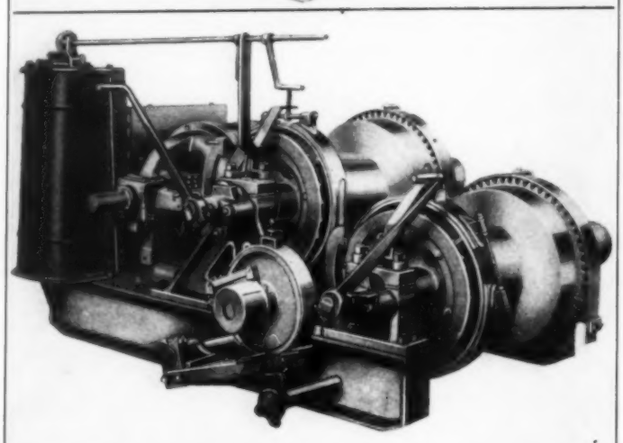
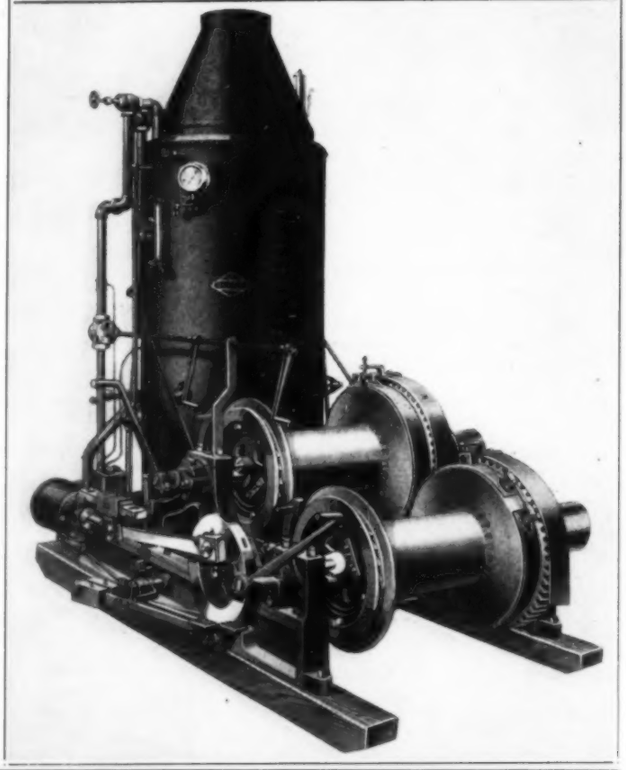
What type HOIST *will you require?*







Post war plans include many construction projects of various sizes and descriptions. These programs will demand more efficient and dependable hoisting equipment to cope with the stepped-up building tempo created by war time construction methods.

Clyde Equipment, geared to meet the needs of tomorrow, will be the solution to your hoisting problems. Designed for performance . . . built for endurance has always been the keynote of Clyde construction.

CLYDE GASOLINE HOISTS, are manufactured in one, two and three drum types with line pulls ranging from 1500 lbs. to 14,000 lbs. Practical, common-sense engineering governs their design . . . strength without useless dead weight; economy without sacrifice of performance. Write for Bulletin K-4 for complete information.

CLYDE ELECTRIC HOISTS are basically the same as gasoline hoists with the exception of the power units. Capacities range from 1000 lbs. line pull to 20,000 lbs. Sturdy, well built machines that are ideal for every type of hoisting duty. Bulletin K-3 contains full description.

CLYDE STEAM HOISTS are rugged and efficient units and are available in sizes from 3000 lbs. to 20,000 lbs. line pull. All Clyde two and three drum hoists can be equipped with a boom swinging attachment.

Write for Bulletin K-2 for specifications.

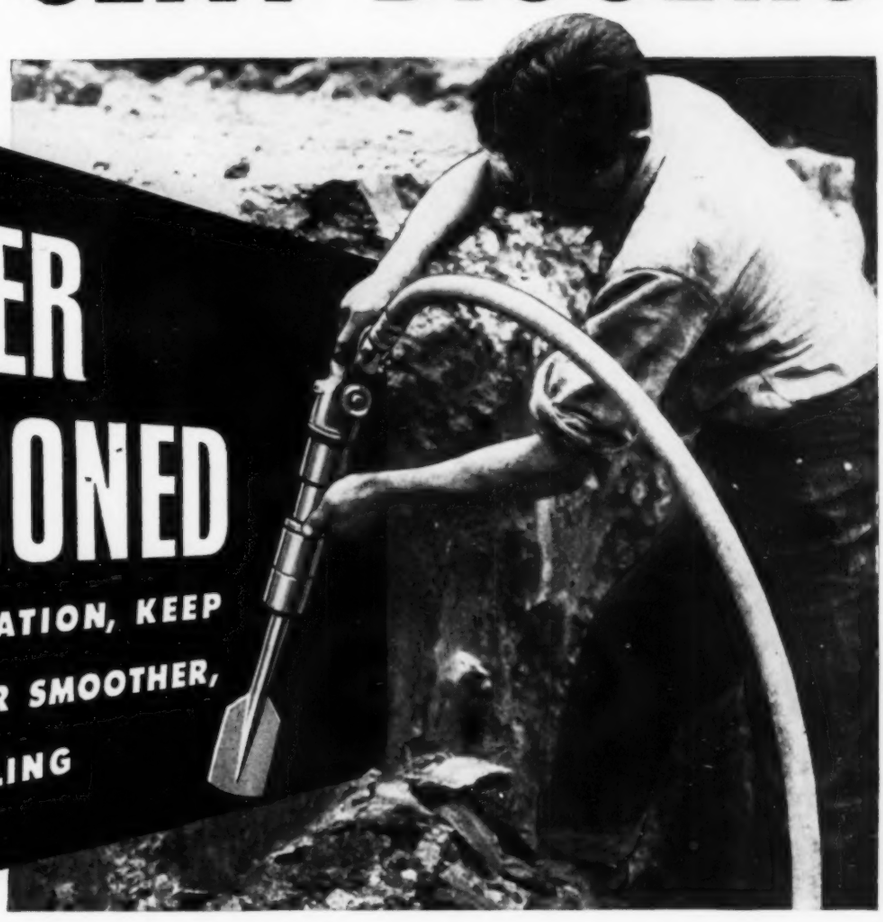
CLYDE

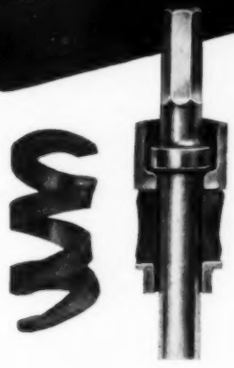
CLYDE IRON WORKS, INC.
DULUTH, 1 MINNESOTA

Thor CLAY DIGGERS

RUBBER CUSHIONED

ABSORB VIBRATION, KEEP OUT DIRT — FOR SMOOTHER, FASTER HANDLING





The Thor "Pig-Tail" Rubber Bumper —deriving its name from this "pig tail" appearance when expanded, is a spiral cushion that fits around the shank of the spade as well as inside the retainer body of the tool.

★ Thor Clay Diggers are smoother handling . . . *faster operating* because they are rubber-cushioned with the exclusive Thor "Pig Tail" Rubber Bumper which absorbs the shock of every blow.

Hugging the spade shank in the retainer body of the tool, this "bumper" fits so tightly against the inside and outside diameters when pressure of the stroke is applied that it positively excludes all dirt and grit to prevent clogging.

Made of a patented synthetic rubber, it is unaffected by oil or grease, stays cooler under operation, and does not deteriorate rapidly.

For full information about these and many more features of Thor Clay and Trench Diggers and associated Thor mining and contractors' tools write today for Catalog 42-A.

Thor *Portable Pneumatic and Electric Tools*

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO 6, ILL.

Branches in Principal Cities

. . . Designed and Built by Steam Generator Experts

TRIM — compact — highly perfected, the Cleaver-Brooks Tank-Car Heater looks and performs like the "finished" product it is.

No other equipment equals Cleaver-Brooks in fast, low-cost, dependable performance—no other equipment has the original and exclusive four-pass, down-draft flue travel and integral fuel-oil burner construction, plus the *perfected* positive dry-coil method of condensate return.

Cleaver-Brooks design and construction provides more and better steam—faster with far less fuel and water. Hot, dry steam flows to car coils in 25 minutes or less —there is no "water-wagon" problem as every drop of condensate is returned to the car heater under pressure.

Cleaver-Brooks heaters are the perfected product of the pioneers and originators of tank-car heaters and bituminous boosters—built by specialists in the construction of portable and stationary steam generators for construction, industrial and military uses. Military engineers usually assign Cleaver-Brooks equipment to the difficult jobs — the hardest chores — because they recognize Cleaver-Brooks' proven capacity and reliability.

Available in two and three tank-car sizes — write for catalog and complete information today — for the jobs to come at war's end.

CLEAVER-BROOKS COMPANY

5125 NORTH 33rd STREET
MILWAUKEE 9, WISCONSIN

ARMY E NAVY

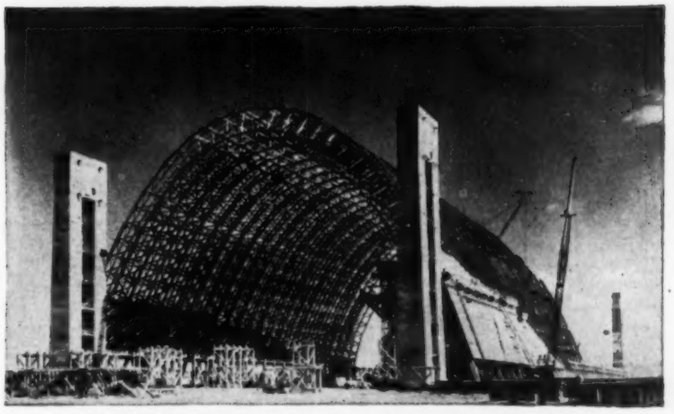
Cleaver-Brooks

PIONEERS AND ORIGINATORS OF

TANK CAR HEATERS . . . BITUMINOUS BOOSTERS . . . AUTOMATIC STEAM PLANTS

Timber Hangars for the Navy's war planes.

THE NAVY BUILDS WITH WOOD



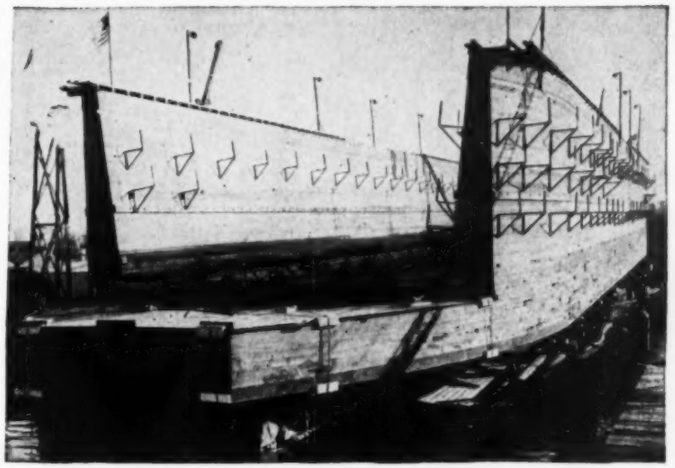
Blimp Dock. The world's largest clear span timber structure recently completed by the Navy. 1000 feet long, 153 feet high, clear spanning 237 feet.

Since Pearl Harbor, the U. S. Navy has used over 2,000,000,000 feet of lumber and timber as a structural material at home and overseas bases.

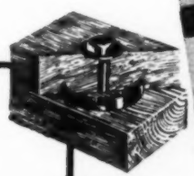
This spectacular use of lumber and the Navy's wide application of the Teco System of Timber Construction have advanced the science of timber engineering. You, too, may have the advantages of timber construction. . . . . strength, economy and permanence . . . . now and in peacetime.

Here is sound engineering advice . . . . . *Design* in timber . . . . *Specify* Teco Connectors . . . . *Employ* a Teco Timber Fabricator.

TIMBER ENGINEERING COMPANY
Washington Chicago Minneapolis
Portland New Orleans



Floating Drydock. Timber connectored structure for vessel repair at sea.



FREE PICTORIAL BOOK

The story in pictures of the Navy's spectacular use of lumber and timber 'round the world.

Specify TECO CONNECTORS AND TOOLS

ENDORSED BY LEADING LUMBER MANUFACTURERS AND FABRICATORS.

Timber Engineering Company
1319 18th St., N.W.
Washington 6, D. C.

Please send me by return mail a Free copy of "BUILDING for BATTLE—With the United States Navy"

Name.....

Firm Name.....

City.....State.....

. . . Designed and Built by Steam Generator Experts

TRIM — compact — highly perfected, the Cleaver-Brooks Tank-Car Heater looks and performs like the "finished" product it is.

No other equipment equals Cleaver-Brooks in fast, low-cost, dependable performance—no other equipment has the original and exclusive four-pass, down-draft flue travel and integral fuel-oil burner construction, plus the *perfected* positive dry-coil method of condensate return.

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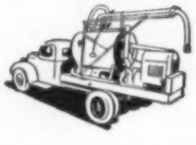
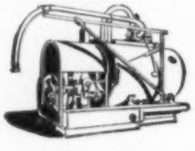
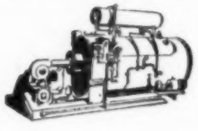

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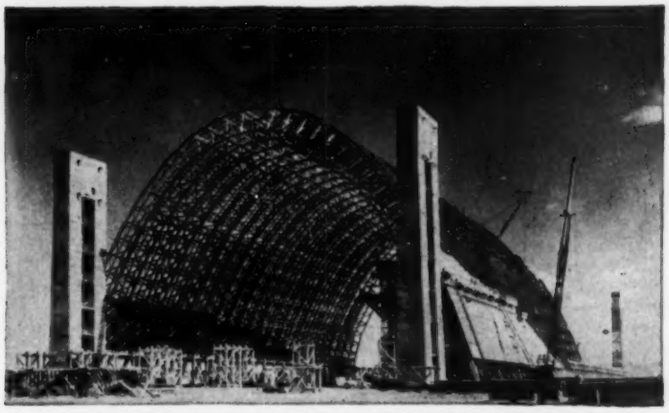

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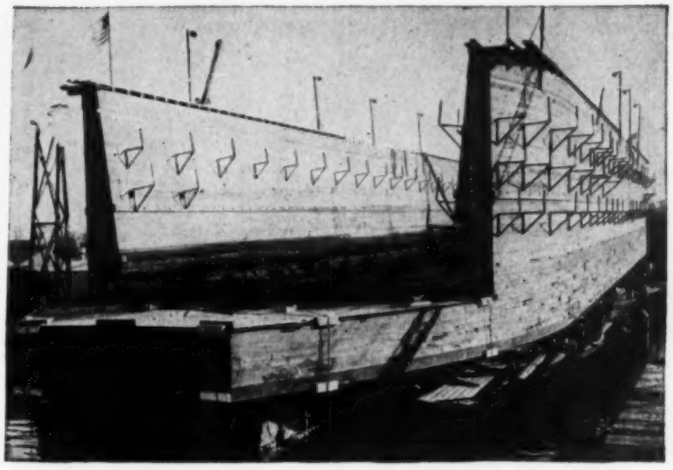

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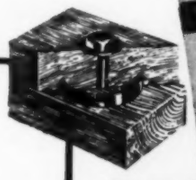

Specify **TECO**

CONNECTORS AND TOOLS

ENDORSED BY LEADING LUMBER MANUFACTURERS AND FABRICATORS.

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...in Peacetime and Wartime -

POWERFUL Trailbuilders and Bulldozers

BONDS SPEED VICTORY

These rugged GW Units are now doing such a vital job for our Armed Forces in this Wartime. GW Units will again take their place in Peacetime, after having distinguished themselves for their outstanding performance.

ALSO

2-wheel Hydraulic Scrapers • Hydraulic Rippers
4-wheel Hydraulic Scrapers • Cable Rippers
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GW ROAD MACHINERY is Sold Through ALLIS-CHALMERS Dealers Everywhere

ROAD MACHINERY DIVISION
GAR WOOD INDUSTRIES, Inc.
DETROIT 11, MICHIGAN

"Hard worker...this Buddy of mine"

When there's a road to be built, or a runway constructed through marshy jungles, important jobs are being done with good, stout Wickwire Rope. In fact, Wickwire Rope was a buddy to many of the men before the war when they were working in oil fields, mines, forests, shipyards and construction jobs.

Seeing that our fighting forces get the wire rope they need is part of our job. Of course, we realize (and they do too), that you also need wire rope to do your bit toward getting supplies to them. It helps speed the day of victory when you make each length you now have last longer.

Proper selection, application and usage of wire rope will make it last longer. If you have a particular wire rope problem we will be happy to be of service. Write Wickwire Spencer Steel Company, 500 Fifth Avenue, New York 18, N. Y.

WHAT ROPE IS BEST ON SMALL SHEAVES?

Our FREE book "Know Your Ropes" gives the answer to this and other wire rope questions. Its 82 pages contain 78 "right and wrong" illustrations, 40 wire rope life savers, 20 diagrams, tables, graphs and charts.

SEND FOR YOUR FREE COPY

Send your wire rope questions to:

WICKWIRE SPENCER STEEL COMPANY

500 FIFTH AVENUE, NEW YORK 18, N. Y.

WS STANDS FOR FRIENDLINESS

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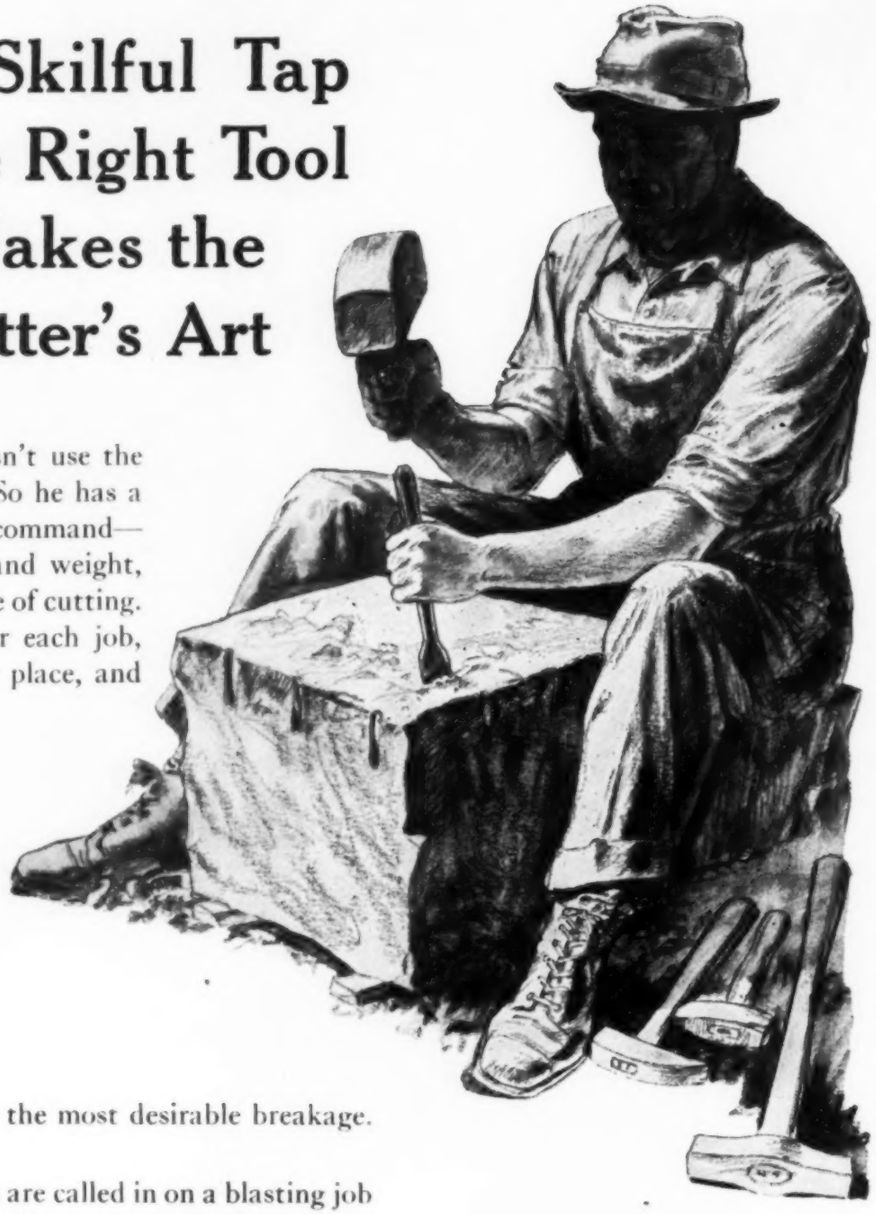
It's the Skilful Tap With the Right Tool That Makes the Stonecutter's Art



THE stonecutter doesn't use the same hammer on all jobs. So he has a number of hammers at his command—each of a different shape and weight, each made for a specific type of cutting. Using the *right* hammer for each job, hitting in exactly the right place, and with just the right force, the stone is cut precisely as the stonecutter wants it.

In blasting likewise you cannot use the same tool for every job and get good results each time. It takes the *right* explosive, used by the right method—with the right force, at the right place—to produce the most desirable breakage.

When Atlas Representatives are called in on a blasting job they apply synergistic* thinking to the problem. They study every detail, swap ideas with the blasting men. From this comes a specific recommendation: The *one explosive*, the *one blasting method*, that will produce the utmost in fragmentation.

***Synergism:** *The force that produces "2 + 2 = 5" results when you and we get together and really "click."*

For "2 plus 2 equals 5" blasting results, consult Atlas.

ATLAS EXPLOSIVES
"Everything for Blasting"

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • Offices in principal cities • Cable Address—Atpowco

MICHIGAN *can do* 5 JOBS *for* YOU

3 SHOVEL

From Clamshell or Crane use, the ⅜ yard and ½ yard MICHIGANS can be quickly converted to shovel use by changing booms. Much time is saved because in the MICHIGAN, no changes are necessary in the operating mechanism. Full circle loading.

4 DRAGLINE

On the regular crane boom, the Michigan Dragline equipment can be rigged in an hour or less. An unusually long reach is possible with this attachment, and the high speed, AIR-CONTROLLED operation of all MICHIGANS means added work capacity.

5 TRENCH HOE

This attachment, with its eleven-foot digging depth, finds scores of uses in public works and private construction.

Trench Hoe is available for both ⅜ yard and ½ yard models, as are all attachments pictured here.

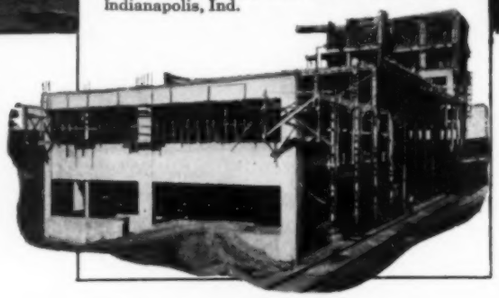
AIR CONTROLLED

WRITE FOR
½ YARD BULLETIN CM44T
AND ⅜ YARD BULLETIN CM44K

MICHIGAN
POWER SHOVEL CO.
BENTON HARBOR, MICHIGAN

In Time for the Harvest

Processing plant of A. E. Staley Manufacturing Company, Decatur, Ill., completed in time to handle the soy bean harvest because Atlas High-Early cement saved three weeks in construction time. The building, under construction, is shown below. Engineer, Vern E. Alden, Chicago. General Contractor, J. L. Simmons Company, Inc., Decatur, Ill., and Indianapolis, Ind.



Atlas High-Early Cement saves three weeks' time in completing Soy Bean Flour Mill

THERE WAS more than just construction time and money at stake in the completion of this soy bean processing plant. A. E. Staley Manufacturing Company had to have the mill ready in time to make flour from the 1943 soy bean crop.

Concrete work started July 1. As harvest time was approaching, Atlas High-Early cement was ordered to speed up the concrete work and permit completing the structure on time. E. R. Mullins, project manager for J. L. Simmons Company, Inc., general contractor, estimated that Atlas High-Early saved three weeks' time, thus enabling him to complete the placing of concrete on August 26.

Slip metal pan forms were often removed within 24 hours, Mr. Mullins reports, and concrete made with Atlas High-Early developed strength in three days normally expected in seven.

Other contractors are having the same experience with Atlas High-Early—saving time, saving forms, saving heating and curing time and cost in winter, releasing equipment more quickly for other work.

Before starting your next "rush" job, send for detailed information on Atlas High-Early and for experience records of other jobs. Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, New York.

• • •

OFFICES: *New York, Chicago, Albany, Boston, Philadelphia, Minneapolis, Duluth, Cleveland, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*

SAVE TIME IN WARTIME WITH

Atlas High-Early Cement

A UNIVERSAL ATLAS PRODUCT

CM—H—63

9 Items to Check When Ordering Wire Rope

(Note: Every day, several orders are received which require correspondence and delay because of insufficient information.

Listed below are items which can be used as a wire rope specification check list. Because wire rope is a controlled material, CMP allocation or symbol, also certification, must be included before orders can be entered.)

WIRE ROPE CHECK LIST

Item	*Example*
1. Length	120 Feet
2. Diameter	¾ Inch
3. Number of Strands	6
4. Number of Wires per Strand	19
5. Lay	Right Lang Lay
6. Core	IWRC
7. Kind of Fabrication	PREformed
8. Grade	(Improved Plow Steel) Monarch Whyte Strand
9. Use	Make, Model of Equipment

(Plus . . . CMP allocation or symbol, also certification.)

Here are all these items for this order.

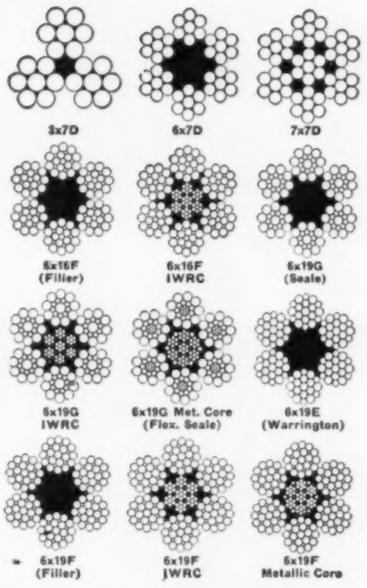
120 feet ¾-inch 6 x 19 Right Lang Lay with IWRC PREformed Monarch Whyte Strand Wire Rope, to be used for hoist line on Model 45 Lorain Skimmer.

Note: For more complete detailed information on how to specify wire rope, refer to Macwhyte G-15 Wire Rope Catalog, pages 89 to 101.

The above check list is normal and complete as to the specifying of wire rope in peacetime, but it is more important than ever in wartime when it is so difficult to get wire rope.

STATE USE FOR ROPE—IT HELPS

Always include the type of service for which the rope is wanted. Then if an error is made in listing the proper construction, or if our experience has shown a different construction gives better service for this purpose, we may be able to help you obtain a better rope. In some cases such information today, makes possible your getting a wire rope to meet your needs when the rope you specify is not available but a similar one is available that might do an even better job for you at no additional cost.



These are but a few wire rope constructions taken from our G-15 Wire Rope Catalog to indicate the vast number of types and constructions of wire rope that are made. As wire rope manufacturers, we are in a position to help wire rope users obtain the correct rope for their specific needs.

HOW TO MAKE SURE OF CORRECT ROPE FOR YOUR EQUIPMENT

There are hundreds of different sizes, grades, and constructions of wire rope. For many years we have cooperated with wire rope users to get the correct ropes for all kinds of equipment. We have watched these ropes give outstanding service on equipment like yours.

The benefit of that experience may help make your wire ropes last longer, or may help you in specifying what we believe is the finest wire rope you can buy — the *correct* rope for *your* equipment: Monarch Whyte Strand PREformed.

Monarch Whyte Strand PREformed has recorded outstanding service records because:

It's made from selected steels.

It's PREformed to reduce internal stresses and to fight rope fatigue.

It's internally lubricated to protect wires and strands against corrosion and friction.

MACWHYTE
PREformed
WIRE ROPE
***Plus* Internal Lubrication**
Selected Steels
Tested—Proved
The correct rope for your equipment

NO. 206

MACWHYTE COMPANY

ARMY E NAVY

WIRE ROPE MANUFACTURERS

The correct rope for your equipment

2941 Fourteenth Avenue, Kenosha, Wisconsin

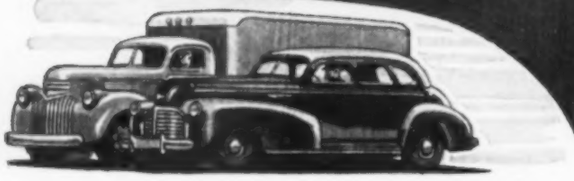
Mill Depots: New York · Pittsburgh · Chicago · Fort Worth · Portland · Seattle · San Francisco. Distributors throughout the U.S.A.

MACWHYTE PREformed and Internally Lubricated Wire Rope · MONARCH WHYTE STRAND Wire Rope · MACWHYTE Special Traction Elevator Rope · MACWHYTE Braided Wire Rope Slings · MACWHYTE Aircraft Cables and Tie-Rods · MACWHYTE Stainless Steel Wire Rope · MACWHYTE Monel Metal Wire Rope

AMERICA MEASURES ITS LEADERS
BY THEIR CAPACITY TO SERVE

CHEVROLET
First in Service

★ ★ ★



CHEVROLET CARS AND TRUCKS

. . . provide wartime transportation and haulage service for more workers and industries than do cars and trucks of any other make.

. . . carry one-fourth of all passenger car and truck traffic for a working nation at war.

. . . lead every other make of car and truck in number of car owners throughout the United States.

CHEVROLET DEALERS

. . . were first among all dealer organizations to provide wartime car and truck conservation service.

. . . provide wartime service for more cars and trucks than does any other automotive dealer organization.

. . . service cars and trucks of all makes to maintain America's wartime motor transportation system.

CHEVROLET MOTOR DIVISION, *General Motors Corporation*, DETROIT, MICHIGAN

"SAVE THE WHEELS SUPER CHEVROLET SERVICE **THAT SERVE AMERICA"**

Every Sunday Afternoon, GENERAL MOTORS SYMPHONY OF THE AIR, NBC Network

TO SPEED VICTORY . . . BUY WAR BONDS

KEEP YOUR SCRAPER IN *Fighting Trim...*

Your 4-wheel scraper is a fighting tool and must be kept at original working efficiency. Maintenance is no longer a question of individual operating costs only—it is an obligation we owe the United Nations, a means to get more material to the far-flung theaters of war through capacity production and conservation of equipment. Help pave the road to victory by following these hints.

1. Follow a regular schedule of lubrication and inspection. Correct troubles before they become serious.
2. Disassemble and clean sheaves periodically to prolong the life of bearings and pins.
3. Check all cable leads to see that ropes are properly aligned to prevent undue rope wear.
4. If a sheave-stand is bent, straighten it before the bad off-lead damages or cuts the cable.
5. Avoid unnecessary cable strain—do not travel with ejector, apron or bowl at extreme height.
6. If cutting edge shows wear, build it up by welding before lip casting becomes damaged.
7. Check all bolts and cotter pins regularly and watch tire inflation.

Bucyrus-Erie scrapers are built to handle the large-scale, high-speed dirt-moving jobs required by wartime production schedules. But even these rugged digging units need vigilant care to give victory performance day after day, job after job. Your International TracTracTor distributor will be glad to help you with a practical maintenance program.

P146-C

BUCYRUS ERIE TRACTOR EQUIPMENT

SEE YOUR
INTERNATIONAL TRACTRACTOR
DISTRIBUTOR

IF your off-the-road job lies in mud or marsh, you'll save time and profit by tiring your equipment with Goodyear Sure-Grips.

This tire was specially designed for the stickiest of conditions. The Goodyear Sure-Grip tire for mud and marsh gives you the flotation you need. And tests show that it gives you from 20 to 50 per cent more traction.

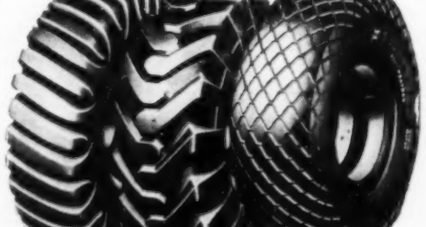
This is just one of the ways that you can call your shots — thanks to years of Goodyear Research.

There is the Goodyear Hard Rock Lug that can take the torture of sharp rock in its sure stride over hard and uneven surfaces.

There is the Goodyear All-Weather Earth-Mover that has the all-round performance needed for every type of drawn dirt-mover.

Each of the Big Three, pictured at the right, contains the maximum amount of live rubber allowed by the government. In addition to that and a tread for every kind of job, all are built on low stretch Supertwist cord carcasses by Goodyear's own multiple-compound method.

The Big Three



GOODYEAR	GOODYEAR	GOODYEAR
HARD ROCK LUG	**SURE-GRIP**	**ALL-WEATHER EARTH-MOVER**
for all rock work	*for mud and marsh*	*for drawn dirt-movers*

(All with Goodyear multiple-compounded construction and low stretch Supertwist cord carcass)

Sure-Grip, All-Weather, Supertwist—T.M.'s The Goodyear Tire & Rubber Company

GOODYEAR

THE GREATEST NAME IN RUBBER

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Construction Methods

ROBERT E. TOMLIN, Editor

Volume 26 — APRIL, 1944 — Number 4

Bridge-Erecting Crane Trucks Speed Ponton Construction by Army Engineers

BRIDGE ERECTING TRUCK backs into position to unload cargo at water's edge. Unit, which consists of special body and 4-ton capacity crane, is 31 ft., long, 9 ft. high, and weighs 26 tons loaded.

PONTON BRIDGES capable of carrying our heaviest mechanized equipment can be built in a few hours by Army Combat Engineers using newly acquired bridge erecting trucks. In recent maneuvers, the 22nd Armored Engineer Battalion built a 330-ft. bridge of rubber and steel in 3 hr. and 2 min. This is made possible by a new-type equipment carrier and erecting unit, consisting of a steel body and a 4-ton capacity crane, built by the Heil Co., of Milwaukee, for mounting on a Brockway Army truck. This equipment brings into use longer, sturdier pontons, improved steel saddles and wider treadways. Each big truck carries pontons, steel saddles and four 2,000-lb. treadways for 30 ft. of bridge.

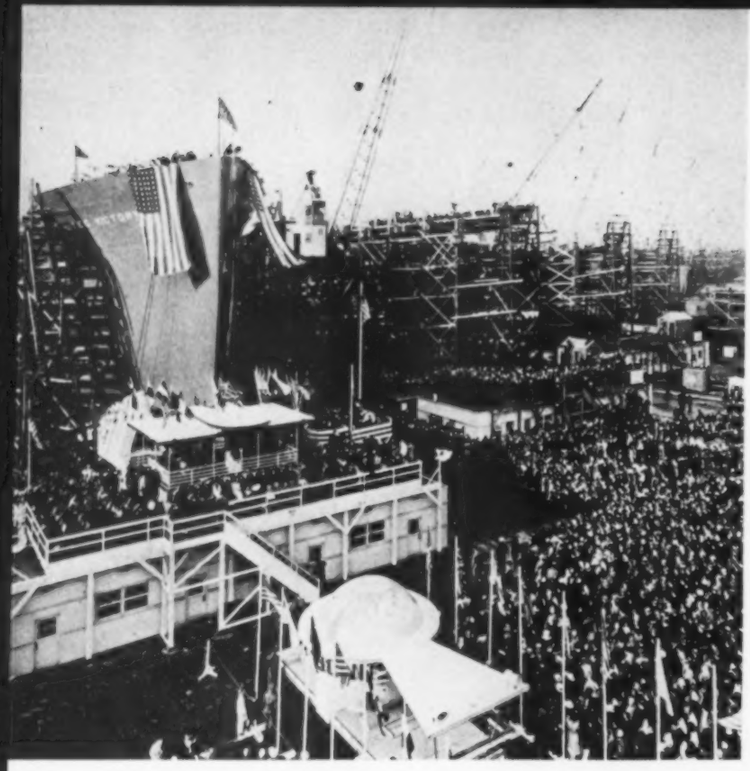
As soon as a fleet of bridge trucks arrives at the bridge site from a camouflaged dispersal point, the first truck backs into position at the water's edge and a big rubber ponton is taken from its heavy canvas covering and unrolled to its full 33-ft. length, and inflated by a mobile air compressor. After the ponton is floated, the crane, with 14-ft. boom, unloads steel saddles which fit snugly over the ponton to give it rigidity and protect it from bullets or flying shrapnel. The saddle is secured by straps at 4-ft. intervals. Two pontons support a pair of treadways, which are unloaded and set in place by the hydraulically

(*Continued on page* 98)

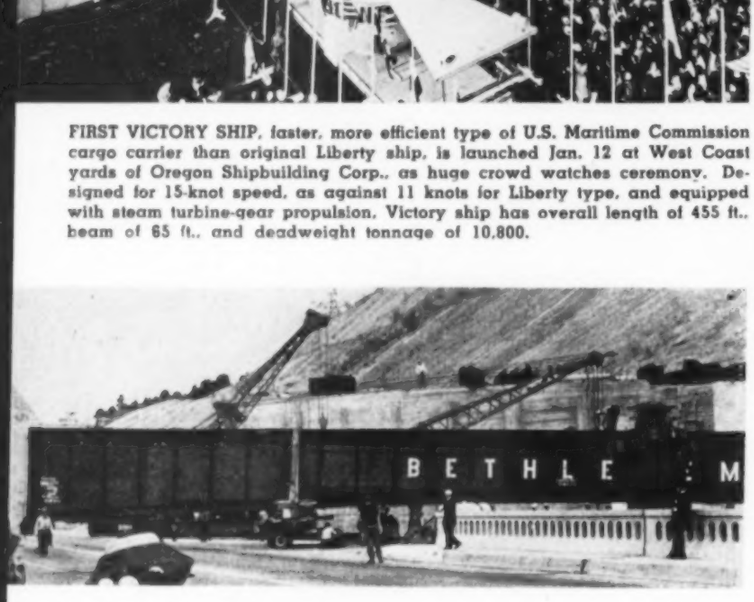
CRANE LOWERS AND POSITIONS pair of 15-ft., 2,000-lb. treadways on 33-ft. ponton saddle. This unit is locked to two others to form 45-ft. bridge section, which is ferried across and fastened to opposite bank.

ARMY ENGINEERS (right) work back from opposite bank to keep near bank clear for assembly of new sections as they are unloaded from carriers by hydraulic cranes. Completed bridge can carry tanks, half-tracks and jeeps.

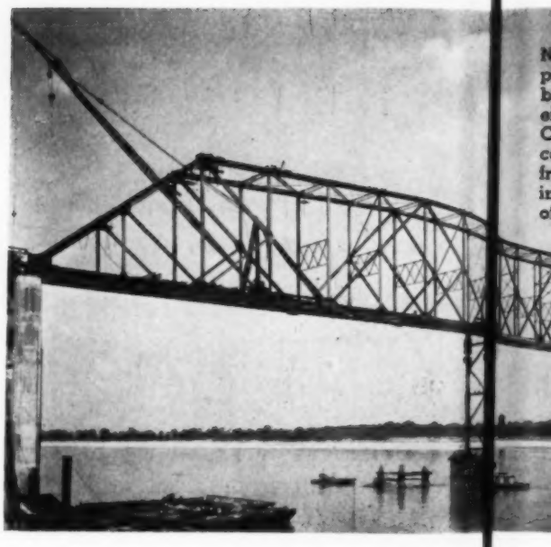
THIS MONTH'S NEWS REEL



FIRST VICTORY SHIP, faster, more efficient type of U.S. Maritime Commission cargo carrier than original Liberty ship, is launched Jan. 12 at West Coast yards of Oregon Shipbuilding Corp., as huge crowd watches ceremony. Designed for 15-knot speed, as against 11 knots for Liberty type, and equipped with steam turbine-gear propulsion, Victory ship has overall length of 455 ft., beam of 65 ft., and deadweight tonnage of 10,800.

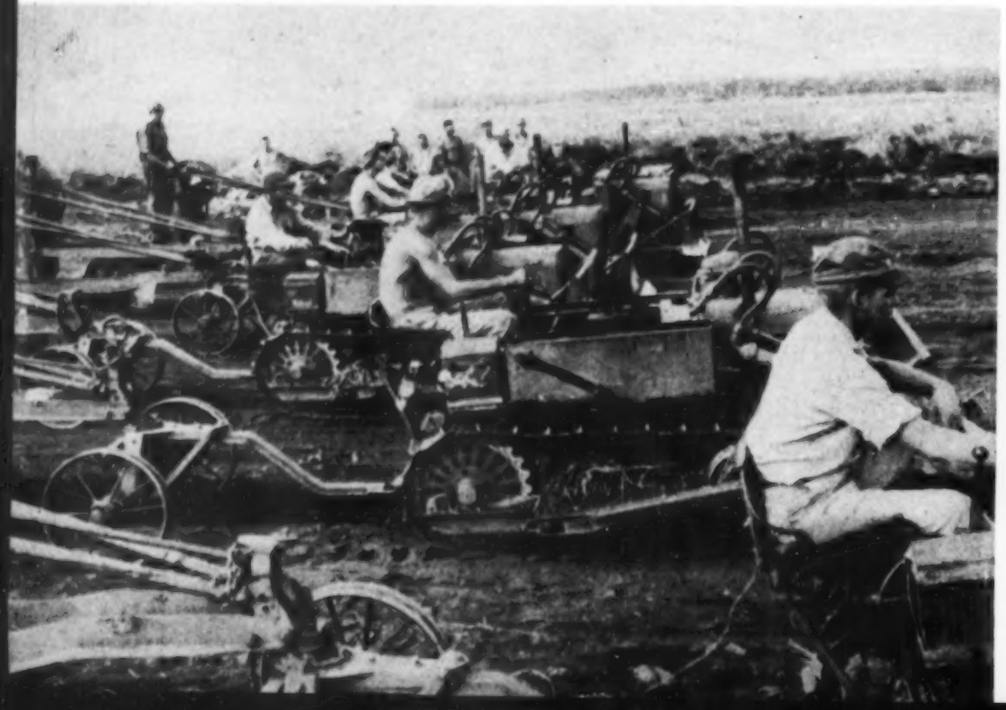


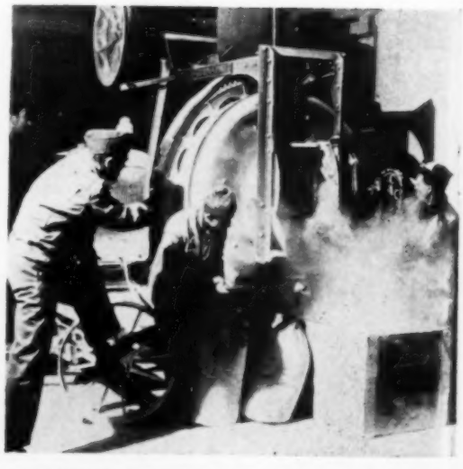
HUGE 82-TON STEEL PLATE GIRDER (left), measuring 146 ft. long, is swung into place at bridge on Arroyo Seco Freeway extension, built for California Division of Highways. Member is picked up by 60- and 40-ton crawler cranes and swung into position by crew of Bethlehem Steel Co. One crane holds load steady while other moves it slowly backward.



AMERICAN BULLDOZERS (below), manned by Allied soldiers and hauling small, pull-type Adams blade graders, break way for assault on Lae, New Guinea, against Japanese. Artillery followed bulldozers and Americans and Australians captured Lae over strong opposition.

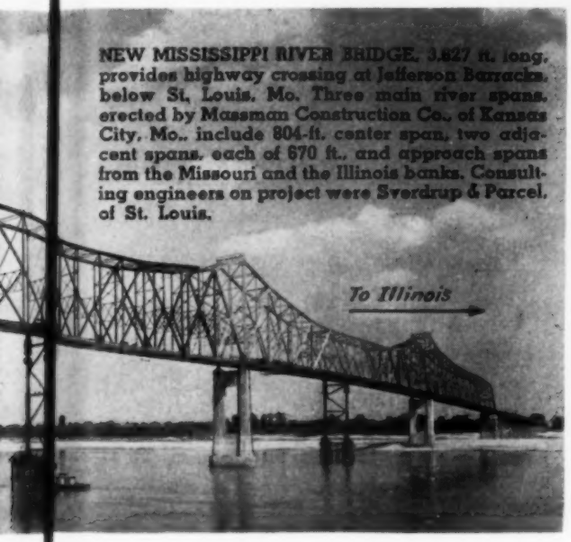
Press Association Photo



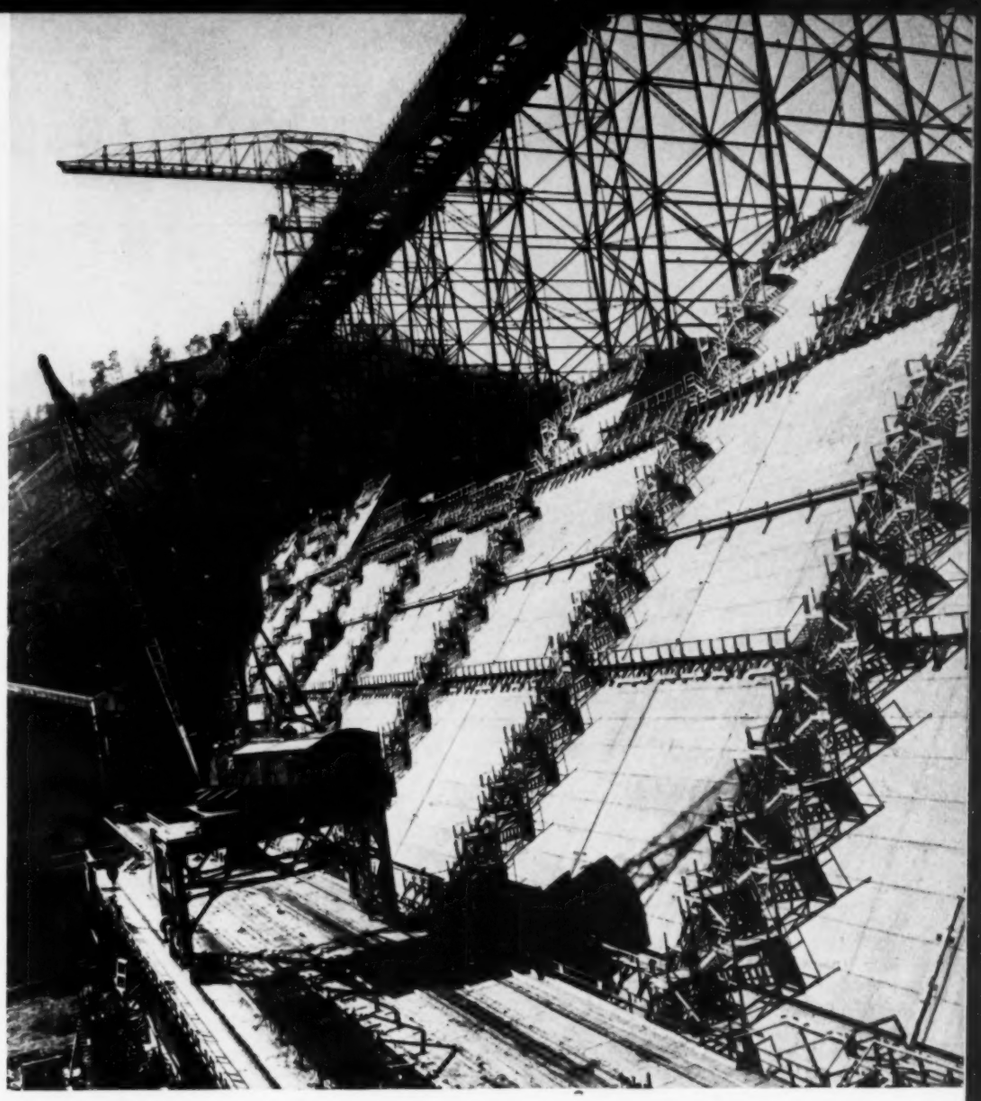


DELOUSING POWDER is blended with Italian talc in 14S Ransome concrete mixer, as U.S. Army wages war against typhus, fever transmitted by body lice, among civilian population of Naples. Acme Photo

NATIONAL WOMEN'S WELDING CHAMPION for second consecutive year is **VERA ANDERSON** (center), Ingalls Shipbuilding Corp., Pascagoula, Miss., worker. She received cup from **W. R. GUEST**, Ingalls executive vice president, after beating **MRS. EDNA SLOCUM** (left), West Coast champ and representative of Moore Dry Dock Co., Oakland, Calif.



NEW MISSISSIPPI RIVER BRIDGE, 3,627 ft. long, provides highway crossing at Jefferson Barracks, below St. Louis, Mo. Three main river spans, erected by Massman Construction Co., of Kansas City, Mo., include 804-ft. center span, two adjacent spans, each of 670 ft., and approach spans from the Missouri and the Illinois banks. Consulting engineers on project were Sverdrup & Parcel, of St. Louis.



WHIRLEY GANTRY CRANE handles concrete, materials and equipment in construction of powerhouse at foot of TVA's Fontana Dam in North Carolina. Operating on high-level trestle, 325 ft. above powerhouse trestle, are two huge hammerhead cranes which handle 4-cu. yd. buckets of concrete.

AMERICAN SALVAGE EQUIPMENT (below), including Buckeye shovel (foreground), is used to clear away debris in port area of Naples, Italy.

British Combine Photo

OIL PIPELINE (below) crosses river in Italy using cables and existing high-tension towers for support. To add strength and flexibility, pipe sections are welded instead of coupled at river crossings. Pipeline was constructed from Italian port to point just behind front lines and put in operation in one week.

Press Association Photo

MICHIGAN BUILDS EXPRESSWA

INTERCHANGE CONNECTION between Southfield Road, which passes under railroad grade separation in background, and Detroit Industrial Expressway varies in width from 14 ft. at bottom to 24 ft. at top, calling for use of false forms by Taylor Bros. Co., contractor, to carry Jaeger-Lakewood two-screed finisher and Flex-Plane joint machine. Ransome single-drum 27E paver places concrete made with air-entraining cement containing Vinsol resin. To speed hardening of pavement on this ramp, 1 percent calcium chloride is added to mix.

AT A COST of more than $2,000,000 per mile the Michigan State Highway Department is extending the Detroit Industrial Expressway 5.8 mi. eastward to a point inside the Detroit city limits from the previously completed section, described in CONSTRUCTION METHODS, February, 1943, p. 52. Divided four-lane concrete pavement, constructed without any steel but with air-entraining cement to increase scale resistance, traverses the length of the present 5.6-mi. section on a broad right-of-way, 300 to 414 ft. wide. A succession of bridges for railroad and highway grade separations and for stream crossings represents the largest cost factor in the current construction program, which involves 25 bridge structures and six pumping stations.

Construction of the 5.8-mi. section made substantial progress during 1943 on

CRANE AND BUCKET (below) place concrete in bridge footings which cannot be reached by truckmixers at Fry & Kain grade separation. After excavating clay and cutting off piles to grade, workmen erect forms and set reinforcing steel in preparation for placing concrete in pier footings.

ON CONCRETE SLAB (below) previously placed by Bridgeport Core Sand Co. on Oakwood Boulevard under grade separation bridge, Peninsular Construction Co., bridge contractor, erects falsework to support beam and deck forms. Piers and abutments of this bridge rest on cellular, box-type footings. In foreground, bridge contractor is excavating for sump of pump house inside timber sheeting.

COSTING $2,000,000 a Mile

40 separate contracts awarded to 23 different firms who were low bidders at letings between April and October. Total value of the 40 contracts approaches $9,000,000, and additional construction included in the immediate program will increase the cost to an estimated $10,750,000. Ultimate development of Section 3, the portion of the expressway at present under construction, is expected to result in a final construction cost of about $13,400,000, as indicated by an accompanying

DETROIT INDUSTRIAL EXPRESSWAY — SECTION 3

February 15, 1944

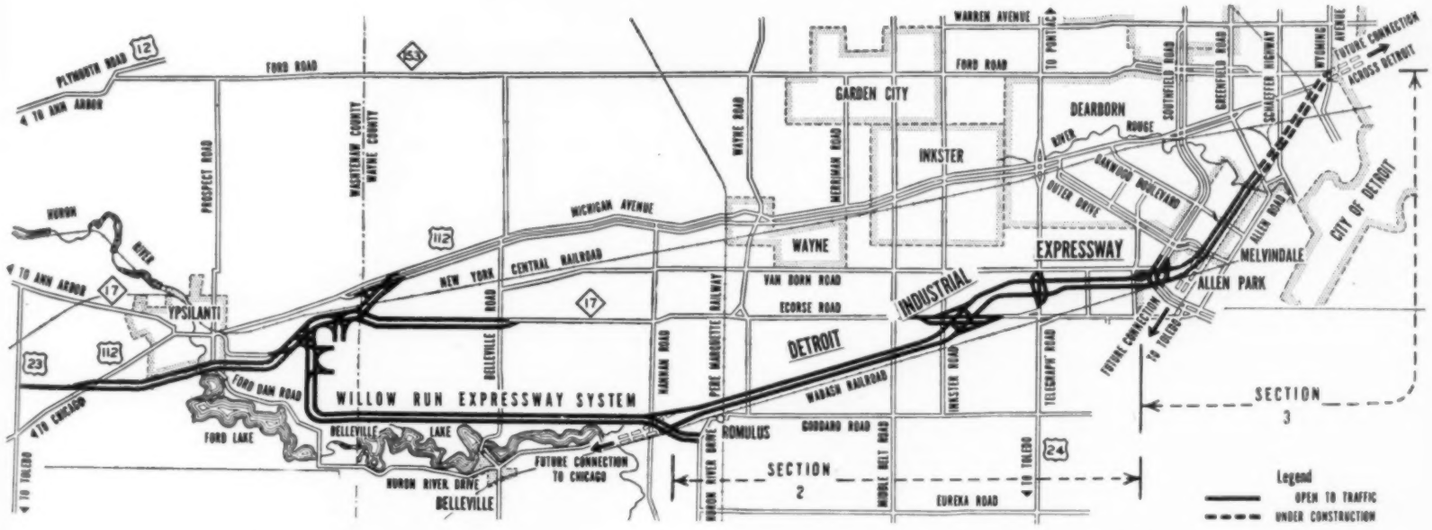
Data on Present Construction

Grading projects	6
Surfacing projects	7
Grading and surfacing projects	9
Sewer project	1
Total	23
Excavation	2,665,434 cu. yd
Overhaul	5,670,673 cu. yd.—sta.
Overhaul	6,215,776 cu. yd.—mi.
Concrete pavement	281,545 sq. yd.
Sewer, 48 in.	1,185 lin. ft.
Sewer, 66 in. (tunnel)	945 lin. ft.
Sewer, 72 in. (tunnel)	1,610 lin. ft.
Contract cost, road construction	$3,192,582
Number of structures	
Bridges (a) River crossings	4
(b) Highway separations	11
(c) Interchanges	3
Railroad grade separations	6
Pumping stations	6
Steam tunnel	1
Total	31
Contract cost of structures, present construction	$7,025,000
Concrete	75,390 cu. yd.
Reinforcing steel	3,719 tons
Structural steel	4,472 tons
Foundation piling	
(a) Concrete piles	251,200 lin. ft.
(b) Timber piles	313,000 lin. ft.
Railroad trackwork	59,000 lin. ft.
Excavation	752,700 cu. yd.
Pumping capacity—total	970 hp.

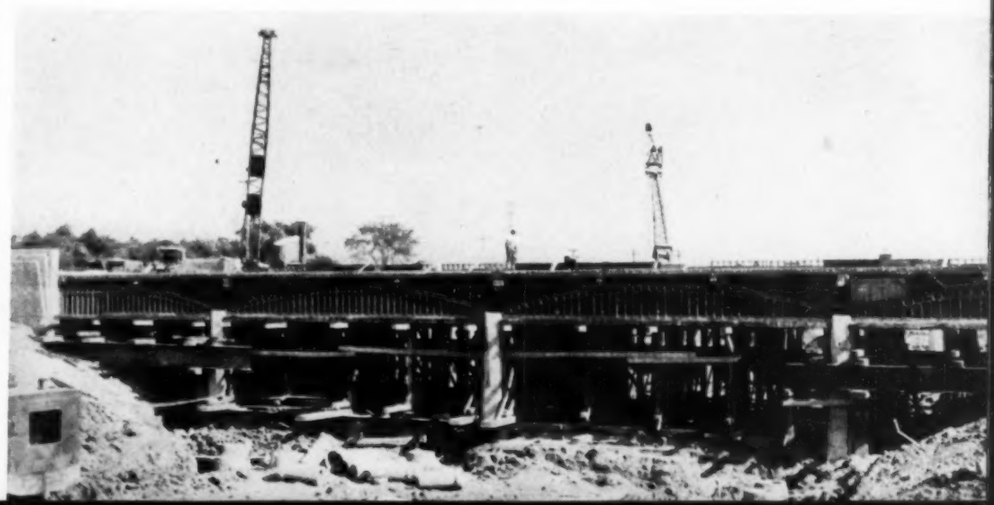
Data on Proposed Ultimate Construction

Number of Structures	
Highway separations	1
Interchange bridges	7
Railroad grade separations	2
Total	10
Estimated cos of proposed structures	$3,215,000
Total estimated cost of structures, present and ultimate construction	$10,240,000
Total estimated construction cost, Section 3	$13,432,582

ADJUSTABLE LEADS 96 ft. long, mounted on steam crawler crane rig of Raymond Concrete Pile Co., handle 81-ft. creosoted pile set in predrilled hole and driven to desired batter for bridge abutment on Fry & Kain contract for expressway grade separation over interchange access road to gate 10, Ford Motor Co., Rouge plant. Abutment piles are driven to 3 in 1 batter; pier piles are vertical. This bridge takes 398 piles, 73 to 84 ft. long.

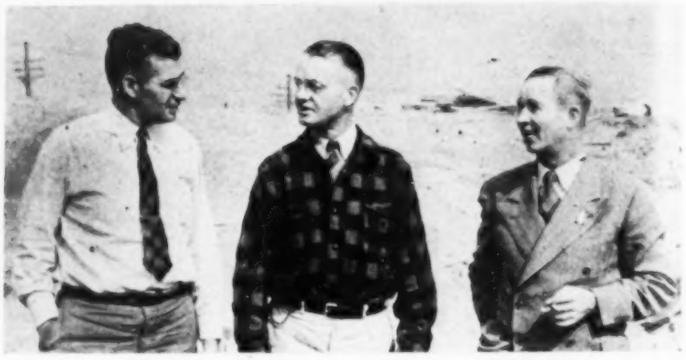


CURRENT CONSTRUCTION of Section 3 extends Detroit Industrial Expressway 5.8 mi. eastward from previously completed Section 2 to point inside city line. Westerly 3½ mi. of Section 3, pushed to completion for opening to traffic on Dec. 8, is built on raised grade, and remaining 2½ mi. to east is depressed.



TWO TYPES OF SUPPORT (right) are employed under falsework of Outer Drive grade separation bridges built by W. J. Storen. In left main span, falsework rests on 36-in. I-beams spanning between pier footings. Falsework in main span at right is supported from timber sills laid on concrete paving slab previously placed.

REMOVING 15 FT. OF RUBBISH and underlying clay to grade through old city dump on depressed portion of expressway. Wilmer Pierson operates four draglines to load excavated material into trucks.



SUPERVISION OF CONSTRUCTION for Michigan State Highway Department rests with **C. H. BROWN** (left), assistant metropolitan engineer and **H. J. (Pat) CONROY** (at right), area engineer in charge of bridges, here talking with **L. D. Abbey** (project engineer at Rotunda Drive improvements.

tabulation of expressway data. This table gives the status of contract construction on Feb. 15, 1944, four months after the period covered by these notes.

Soil conditions on Section 3 influenced the design of the expressway. For about 2 mi. at the westerly end of the section, west of the Rouge River, sand acceptable for highway embankment and pavement base could be found in a few workable deposits within a mile of the right-of-way. Along the right-of-way on this portion of Section 3, the thin top cover of soil and sand quickly changes to a deep layer of soft blue clay which extends to a depth of about 70 ft. below the surface of the ground, where it brings up on hard clay. East of the river, soil formations are much the same, except for the fact that no thin sand layer intervenes between the soft clay and the topsoil. Most of the bridges rest on long piles driven into the hard clay. Ledge rock ordinarily is encountered about 20 ft. below the top of the hard clay.

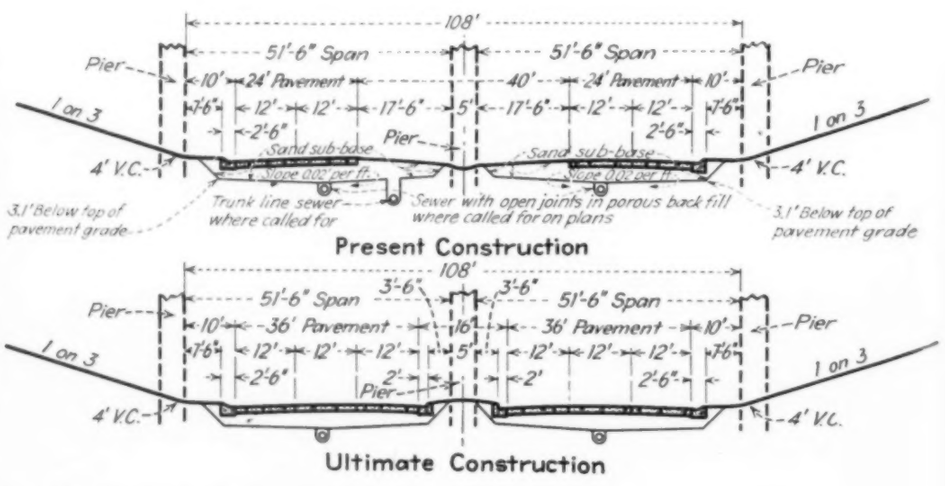
For about 3 1/3 mi. in the westerly portion of Section 3, where the overhaul for sand fill from the pits was not excessive, expressway pavement is carried on raised grade, 4 to 8 ft. above original ground, and intersecting roads are depressed to pass under expressway bridges. In the remaining 2½ mi. to the eastern terminus of Section 3, the expressway is depressed to eliminate costly sand fill and to simplify construction of grade-separation bridges which carry intersecting highways and railroads across the freeway. On the raised-grade portion, the normal separation of the two-lane roadways is 164 ft. between center lines. In the depressed portion, the distance reduces to 84 ft. c. to c. of two-lane pavements. Provision is made to add a future third lane to the inside of each roadway. These and other design features are shown in accompanying cross-section drawings.

Location of Section 3 with respect to completed Section 2 and the Willow Run expressway system is indicated by an accompanying map. Section 1 of the expressway, crossing the city of Detroit, will not be started until steel can be released for construction of a continuous elevated viaduct. For most of its length,

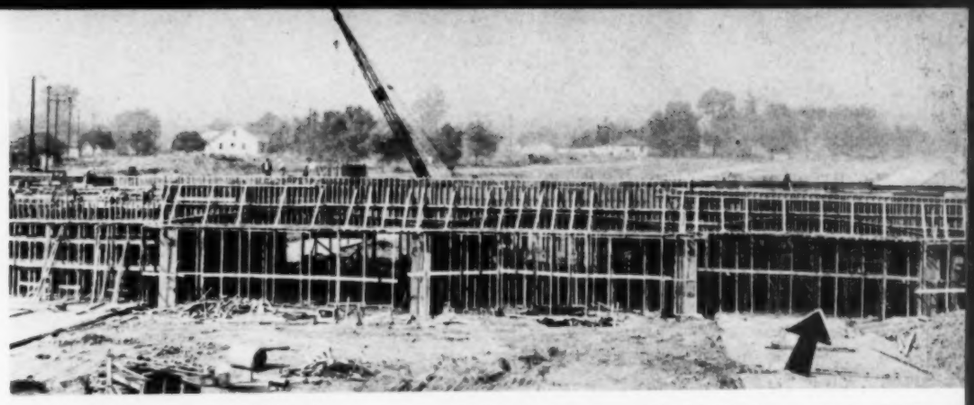
(Continued on page 114)

FIVE SHAFTS (below) 12 ft. in diameter and about 30 ft. deep serve construction of 2,750 ft. of tunnel on sewer contract of A. Arcari Construction Co. Concrete for tunnel lining is dropped through elephant trunk spout to narrow-gage car.

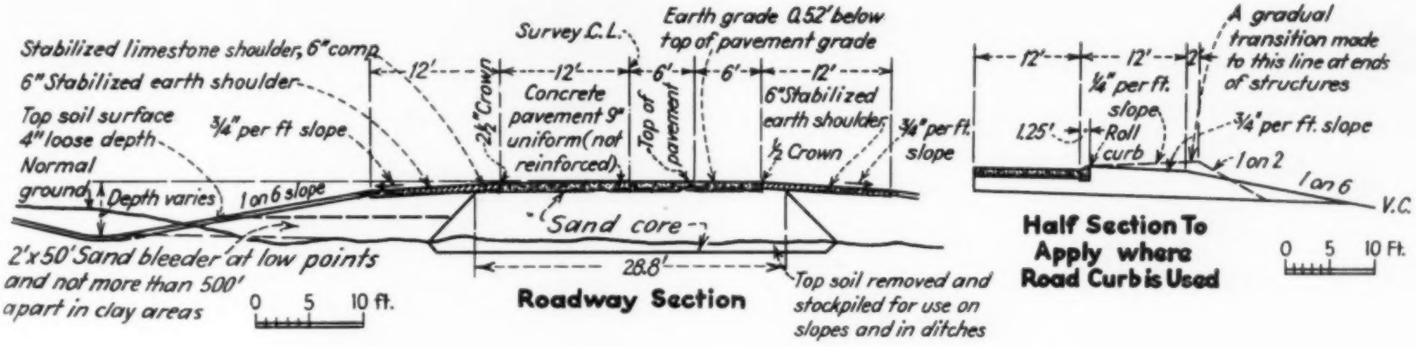
DEPRESSED PORTION of expressway (below) from Greenfield Road to city limits of Detroit, draws roadways of divided four-lane pavement more closely together, with 84-ft. spacing between center lines, and provides for addition of two future lanes at inside edges of present pavement construction. Sand base under pavement is built to full width to take care of pavement widening included in future plans of Department.

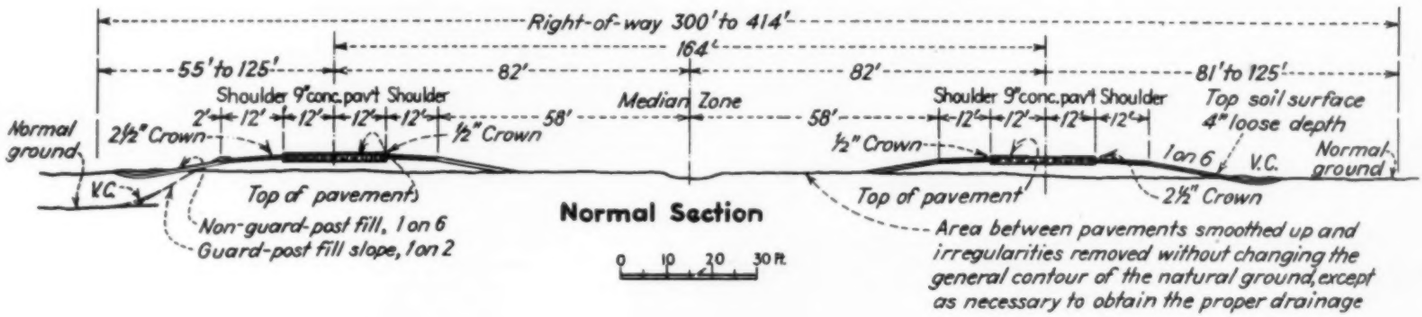


PAIR OF SIX-SPAN BRIDGES carry two roadways of Detroit Industrial Expressway across Southfield Road. To avoid disturbing deep clay layer by driving piles, these bridges are supported on spread footings, with heavy reinforced-concrete slab between pier footings. Pavements of two roadways under bridges are laid on these slabs, and temporary stone surfacing is placed on slabs in two inner spans, which will be used in future to accommodate additional pavements. Bryant & Detwiler, Detroit, contractor for two bridges; Taylor Bros. Co., Inc., Birmingham, Mich., contractor for paving.



VARIED TYPES OF FALSEWORK support beam and deck forms of bridge built by Darin & Armstrong to carry Van Born Road across Southfield Road. Arrow points to welded tubular sectional scaffolding used as falsework on top of concrete pavement in span at right.

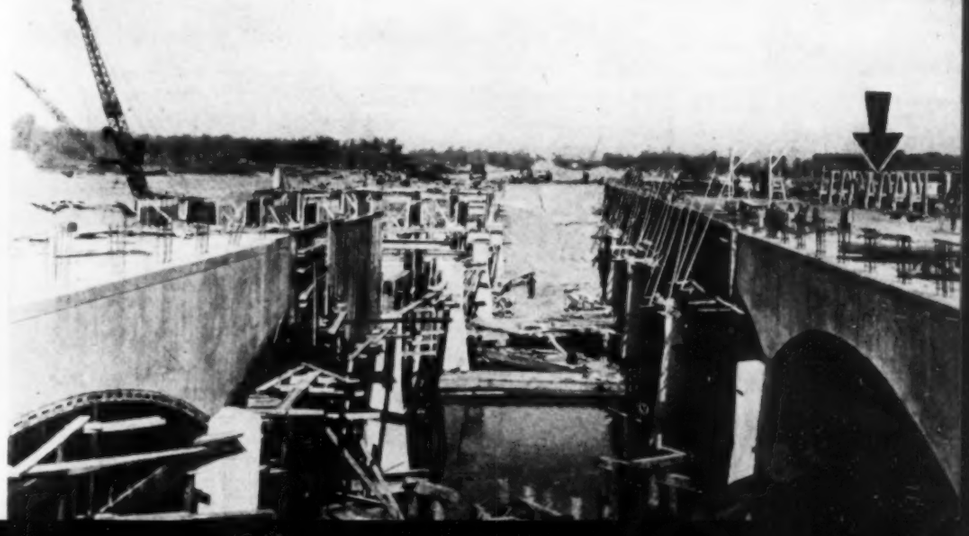




RAISED-GRADE SECTION of Detroit Industrial Expressway puts two-lane pavements of divided four-lane freeway on sand-core embankments rising 4 to 8 ft. above existing ground surface, which is generally level. Normal separation of divided roadways is 164 ft. between center lines of pavements on minimum right-of-way 300 ft. wide. When needed, future third lanes will be added on inside of two roadways.

WITH ONE HAND on top lagging of tunnel shaft (below), A. ARCARI, contractor, puts a question regarding his sewer construction problems to SCOTT A. BAKER, acting construction engineer for Michigan Highway Department.

ON TWO BRIDGES (below) across Rouge River, W. J. Meagher, contractor, Bay City, places concrete with single-chamber Pumpcrete through 6-in. pipeline elevated on horse trestle, as indicated by arrow at right.



Two-Crane Team

Drives Long Batter Piles

Photos from Michigan State Highway Department

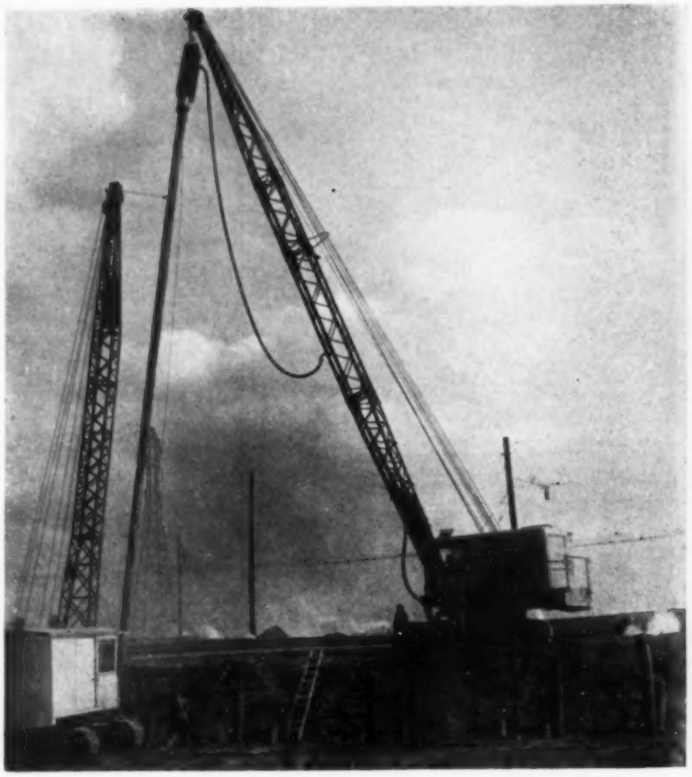
1 DRIVING CAP and hammer handled by one crane are attached to butt of long creosoted timber pile preparatory to picking up pile and setting it in predrilled hole, bored to proper batter.

BY SKILLFUL COORDINATION of two cranes working as a team, L. A. Davidson, contractor, Lansing, Mich., dispenses with hammer leads in driving long batter piles to support bridge abutments of grade separation structures built by him for the Michigan State Highway Department at several locations along the Detroit Industrial Expressway. Accompanying photographs show how the two cranes handle the job.

Creosoted timber piles 90 ft. long were required for the abutments of the Schaeffer Road grade separation, where the pictures were made. Davidson's bridge at this location carries Schaeffer Road over the divided pavements of the expressway, which is depressed in a cut. Abutment piles are driven at 3 on 1 batter.

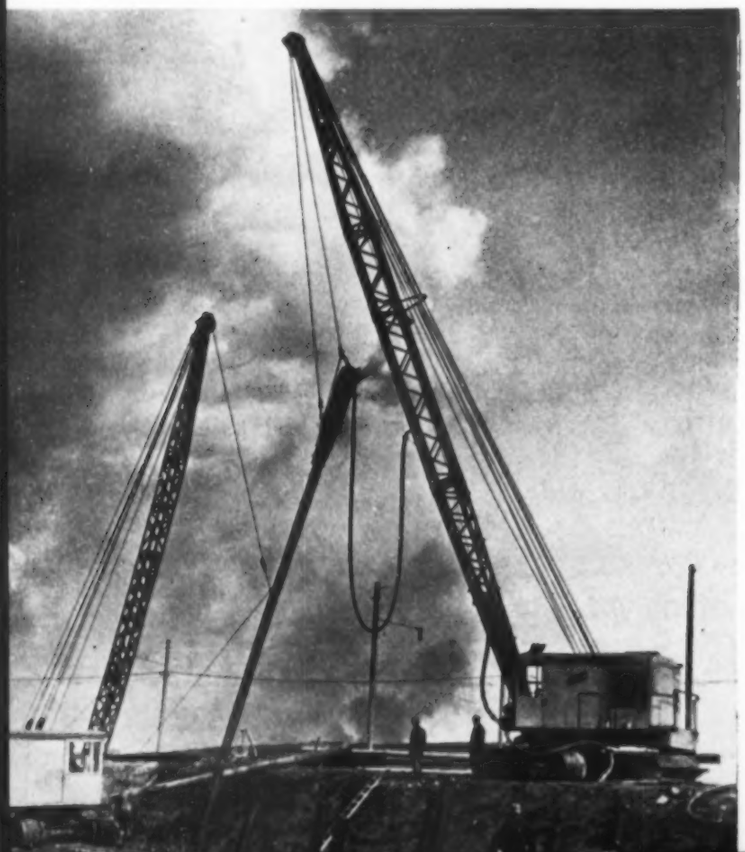
To facilitate initial setting of each batter pile at the proper inclination, the contractor pre-bores a starting hole with a mobile earth drill mounted on two wheels. Before raising the pile from the ground, one of the cranes fits the hammer unit,

(*Continued on page* 132)

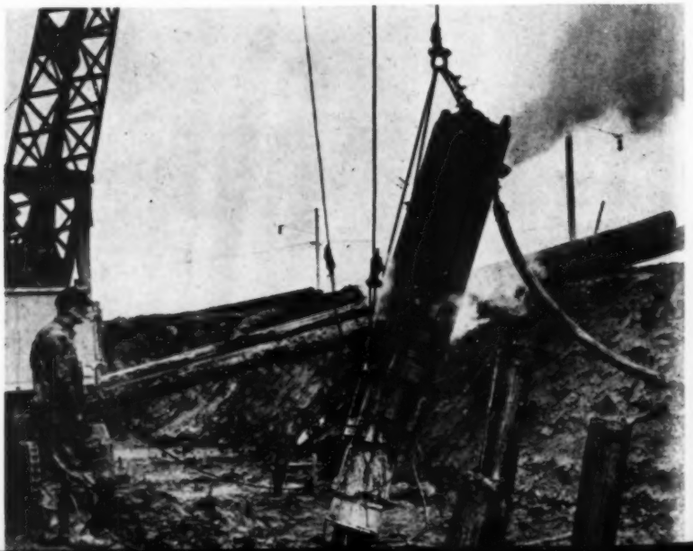


2 WITH AID OF SECOND CRANE, long pile tied to hammer unit is raised into position to be inserted into hole previously bored at proper batter by mobile earth drill.

3 STEADIED AT PROPER ANGLE (below) by load line and tag line of second crane, long batter pile is driven to desired penetration by steam hammer suspended from long boom of crane on top of bank. Steam is furnished by auxiliary boiler unit.



4 TWIN BRIDLES (below) on load line and hitch on bucket-closing line support steam hammer and attached ferrule extension of driving cap on butt of batter pile. Wire rope loops used to tie hammer unit to pile have been slipped up over ferrule by workman as hammer approaches ground.



"THE FIGHTING SEABEES." Republic motion picture, tells how American contractor, Wedge Donovan, and his men, after having built defense works as civilians on Pacific island, join up with Navy's Construction Battalions and, in face of attacks by Japanese force, build docks, airfields and oil storage depots. Firing from bulldozer (above, left)—an Allis-Chalmers tractor rigged with Buckeye blade, which they are using to build airfield, they live up to Seabee tradition of "Work and Fight." Principals in motion picture cast include (above): DENNIS O'KEEFE as Comdr. Robert Yarrow; SUSAN HAYWARD as Constance Chesley, war correspondent; and JOHN WAYNE as Wedge Donovan.

JOB oddities

LIKE PYGMIES appear P. L. GRAVES, resident engineer for C. & O. R. R., and E. E. THOMPSON, loader for Bates & Rogers Construction Corp., against background of huge rock face of 4,000-ft. long Blue Ridge bore for Chesapeake & Ohio Railroad in Virginia. Full face, measuring 28 ft. high and 24 ft. wide in timbered sections and 26 ft. high and 20 ft. wide in unsupported sections, is blasted at one time. Each round required from 60 to 75 holes, 10 to 12 ft. deep, drilled from big three-platform jumbo by column-mounted Ingersoll-Rand drifters.

SHIPSHAPE SWEEPSTAKES (below), symbolized by huge, yellow-painted broom, is awarded periodically for cleanest of several shipyards of Henry J. Kaiser's Permanente Metals Corp. at Richmond, Calif. Here "golden broom" is being carried off by its new custodians, representing Yard 4.

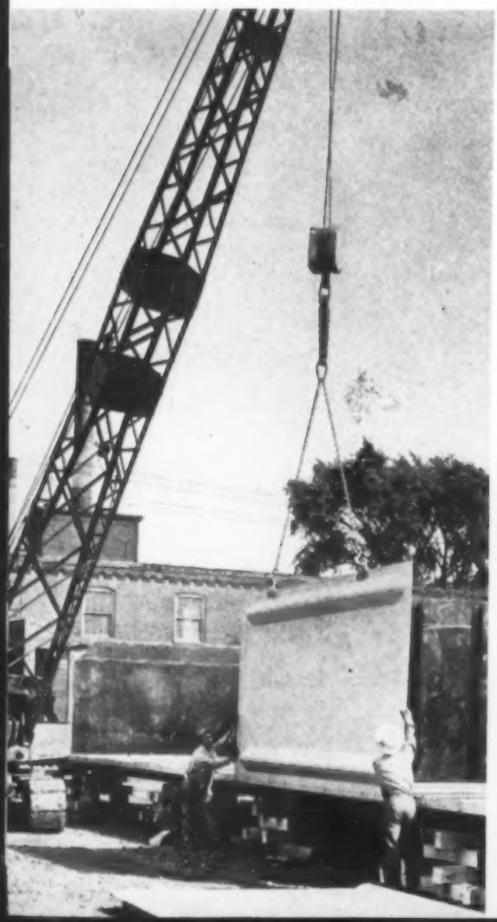
Fore 'n' Aft Photo

RESEMBLING GIANT STARFISH, this 27-ton mass of steel is "skeleton" of waterwheel generator for Watt's bar project of Tennessee Valley Authority. Machined at East Pittsburgh Works of Westinghouse Electric and Mfg. Co., it is 22 ft. in diameter and will revolve 95 times per minute inside generator. Project will supply power for war plants in vicinity.

FLANGED WHEELS (below) on U. S. Army 2½-ton truck convert it to use for pushing cars on railroad track somewhere in England. Railroad is operated by Ordnance Unit composed of ex-railroad workers from United States.

British Combine Photo

COMPLETE SYSTEM OF BULKHEADS is in place and a few sections of steel deck have been set by crane mounted on railway flat car.

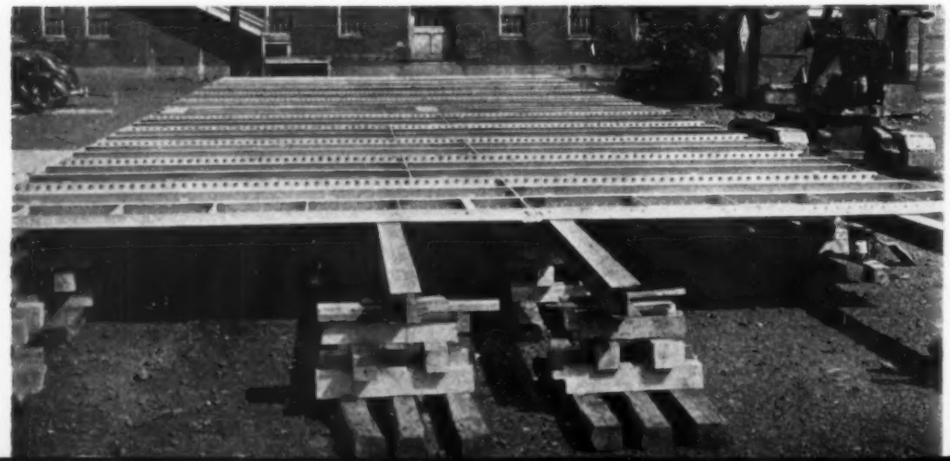


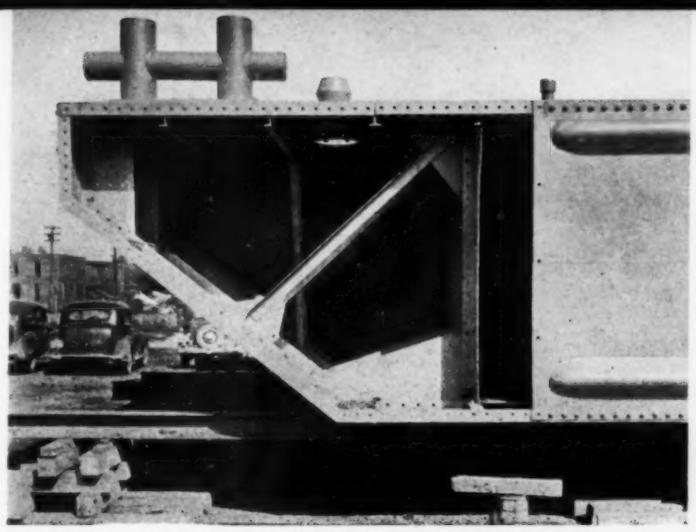
FIRST SIDE PANEL (left) is set by crawler crane equipped with chain sling on fall line.

Steel Barges

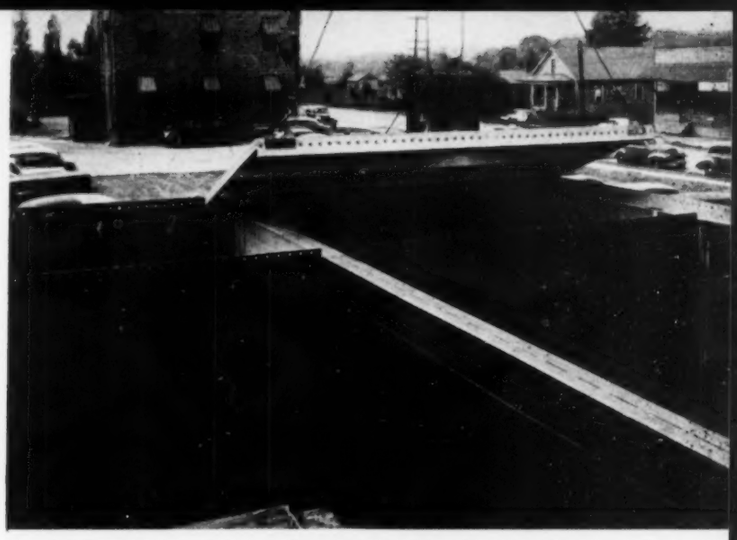
Assembled by Bolting Prefabricated Sections

BOTTOM ASSEMBLY (below) on ways constitutes first operation in barge building. Close tolerances in individual sections insure accurate fitting together of units.

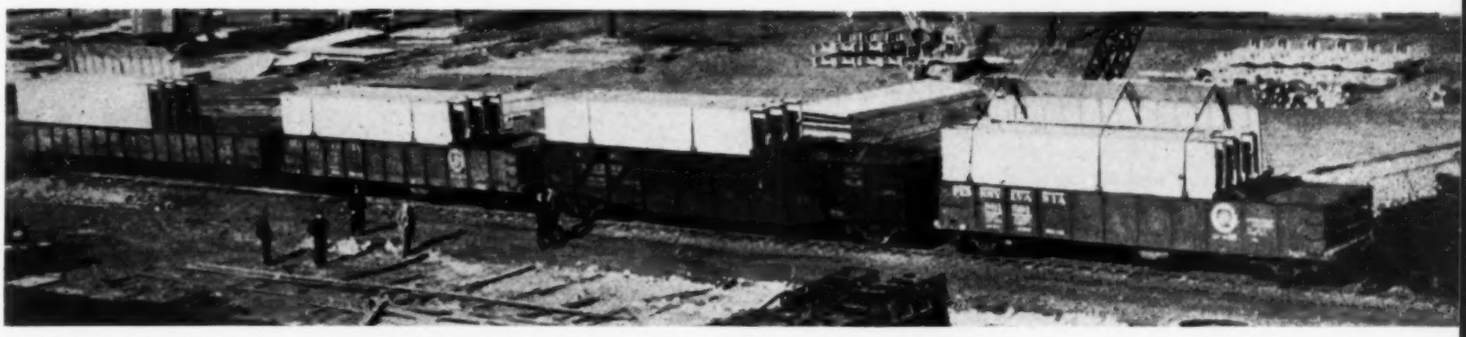




CONSTRUCTION DETAIL shows system of bracing used in collision bulkheads at bow and stern of barge.



DECK PANEL is lowered into place after bulkheads and side panels are in position. Note system of bolt holes and clips for handling panels.



PACKED FOR SHIPMENT, the panels and other steel barge sections are loaded in railway gondola cars.

FOR USE BY THE ALLIED ARMIES on many war fronts, bolted sectional steel barges of a new type, adapted from a basic design of the American Steel Dredge Co., Fort Wayne, Ind., are being produced at a number of plants in this country by prefabrication in standard panels and sections which are shipped abroad in knocked-down form and assembled at the point of use. Each element of the barge unit is marked according to a standard code and packed in a systematic manner to eliminate the need for searching for the right piece during the operation of assembly. Fabricated to tolerances of 1/16 in. in 104 ft., all sections and panels are interchangeable.

Designed for either liquid or dry cargo, the barges have a capacity of more than 500 tons. They are 104 ft. long, 29 ft. wide and 9 ft. from deck to bottom. Sub-bottoms are welded in place between side panels and bulkheads, making the barges gasoline-tight. Four large, sealed hatches provide access to the hold when handling cargo. To facilitate erection, a comprehensive manual has been prepared describing by text and illustration the step-by-step procedure of assembly and launching. With trained supervisors, unskilled personnel has assembled one of these barges in 500 man-hours.

Through the application of outboard motors, these barges are converted into self-propelled units, one of which can, under suitable conditions, tow several non-powered barges. In the handling of supplies and equipment on shallow inland waterways, this feature is said to be of great importance.

SAFETY HOOK

devised by W. S. Worthington, safety engineer for Cincinnati district, U. S. Engineers, prevents concrete bucket from being dropped as gantry whirley swings bucket through air in construction of Mill Creek pumping station, Cincinnati, recently completed for U. S. Engineers by LaCrosse Dredging Corp. and Ferd J. Robers Construction Co., joint contractors.

LEGAL ADVENTURES of TRACTOR CONN

By LESLIE JOBB

No contractor ever tries to be his own dentist or his own shoemaker. It is even more dangerous for him to be his own lawyer. There are, however, some legal rules which every contractor should know, and these rules may be explained in plain English without resorting to the jargon of the law, unintelligible to most laymen.

This series of articles, dealing with the Legal Adventures of Tractor Conn, a typical contractor anywhere in the United States, explains some of these legal points in plain language for the contractor. Each one is based on an actual decision of an American Court.

The Case of the Unordered Surplus

Tractor Conn was short just 850 bags of cement to complete a rush contract, was forced to buy in the open market, and bought from an up-river jobber at a satisfactory price.

"That will be fine. When can you ship?" Conn agreed and queried.

"I'll ship out today and you'll get it day after tomorrow," was the ready answer.

Ten minutes later a local jobber telephoned Conn.

"That cement our bookkeeper told you this morning we didn't have was in the back warehouse that very minute. How much do you want?" the jobber asked.

Conn did some rapid mental arithmetic, decided that it would be worth while for him to pay the up-river jobber damages, and promptly switched the order to the local man.

In a couple of days the freight agent telephoned.

"We have a shipment of 1,000 bags of cement billed to you," the agent explained.

"To me? There must be some mistake. Where is it from?"

The freight agent gave the name of the obliging jobber.

"I only ordered 850 bags, and have no use for the balance. I refuse delivery, and you can tell him so," was Conn's reply. The jobber went to law and regretted it.

"But where the seller knowingly sends more or less than the quantity ordered, he is guilty of an intentional violation of the contract which he undertakes to perform: and it would seem that he has no right to presume that the purchaser will accept. He must show an actual acceptance, by proving either that Conn retained and used the cement or that he did some other act from which his assent may be presumed," said the Wisconsin courts in ruling in Tractor Conn's favor.

"If he hadn't been so greedy, and tried to pad your order, the decision would have been the other way," Conn's lawyer assured him.

The Case of the Printer's Error

Tractor Conn ordered some note forms from the local printer. According to the copy which Conn furnished, the body of the note was to contain a proviso that all the parties to the note waived presentment, notice and protest, and consented to be sued in the county where Tractor Conn lived, moved and earned his daily bread and rationed butter.

"Some of these notes will be endorsed, so you can print the same clause on the back of the note," Conn ordered. When the printed notes were delivered, everything was in proper order except that the proviso on the back contained no reference to suit being brought in that particular county.

"I don't see what harm that will do, for the face says that 'all parties' agree to be sued in my county," Tractor Conn assured himself. He took a note from John Doe, endorsed by Richard Roe, and then, on the strength of the waiver in the note, sued Richard Roe in Conn's county, which he could not have done if the note had been in the ordinary form.

"All I am bound by is the proviso over my signature," Richard Roe argued, and the Alabama Supreme Court ruled in his favor in the case of Shows vs. Jackson reported in 110 Southern Reporter 373.

"The usual stipulation or condition as to the place of suit will not be supplied by implication evidenced by the written endorsement," the Court said.

The Case of the Disputed Insurance

Three telephone conversations, a fire and an insurance policy make up Tractor Conn's latest legal adventure.

Telephone conversation No. 1:

"Yes, this is the manager of the Xyro Construction Co."

"Tractor Conn speaking. How much will you take for all your supplies and machinery in the Orton warehouse—lock, stock, barrel and the whole works?"

"$25,000."

"You've sold and I've bought."

Conn then dialed another number for telephone conversation No. 2.

"That the Midland Insurance Co.? This is Tractor Conn. I just bought all the contracting supplies in the Xyro Company's warehouse for $25,000 and I want the usual fire policy to cover it."

"You'll have the policy this afternoon."

Five days later Conn hurriedly called the insurance company for the third and last conversation.

"This is Conn again. I've just learned that fire has destroyed all the supplies at the Orton warehouse that I insured with you the other day."

"We know that," the Midland manager answered, "but we also know now that your purchase of those supplies was oral and so was not binding in law, so you had nothing to insure. Sorry, but we don't owe you anything."

"You may be right," was Conn's comeback, "but we'll have to see what the courts say on that point."

"The oral contract to purchase was not void or illegal by reason of the statute of frauds: it affects the remedy only as between the parties, and not the validity of the contract itself; and where the contract has actually been performed, even as between the parties themselves, it stands unaffected by the statute," said the Massachusetts Supreme Judicial Court, in ruling in Tractor Conn's favor.

More Legal Adventures of Tractor Conn Next Month

Two Powerful *Floodlights* Illuminate Night Work on *Norfork Dam*

TWO POWERFUL LIGHTS augment original illumination provided by 13 conventional floodlight towers at Norfork Dam. In background is 2,000,000-candlepower carbon-arc searchlight mounted about halfway up cableway head tower at right abutment. At extreme left is wide-angle floodlight of equivalent power rating which focuses 180-deg. horizontal layer of light on top of dam.

This article is the last of a series of five on Norfork Dam. Earlier articles were as follows: October 1943, p. 62; November 1943, p. 78; January 1944, p. 66; March 1944, p. 86.

AS AN AID TO NIGHT OPERATIONS on war-speeded Norfork Dam, 1,500,000-yd. concrete gravity structure ½ mi. long, designed to impound water for flood control and power on the North Fork River in Arkansas, The Utah Construction Co. and Morrison-Knudsen Co., Inc., contractors for the U. S. Engineers, have installed two 2,000,000-candlepower electric carbon-arc lights which provide illumination of about 5 footcandles over 1,750 ft. along the top of the dam and in the powerhouse area. One of the two powerful lights, a 60-in. carbon-arc searchlight, is mounted about halfway up the 150-ft. head tower of twin cableways which deliver concrete from the mixing plant to the dam. The second, a wide-angle (180-deg.) Sperry-Aga floodlight, is set at the lower end of a concrete training wall which projects downstream from the dam. These lights operate in conjunction with floodlight towers of conventional type previously erected.

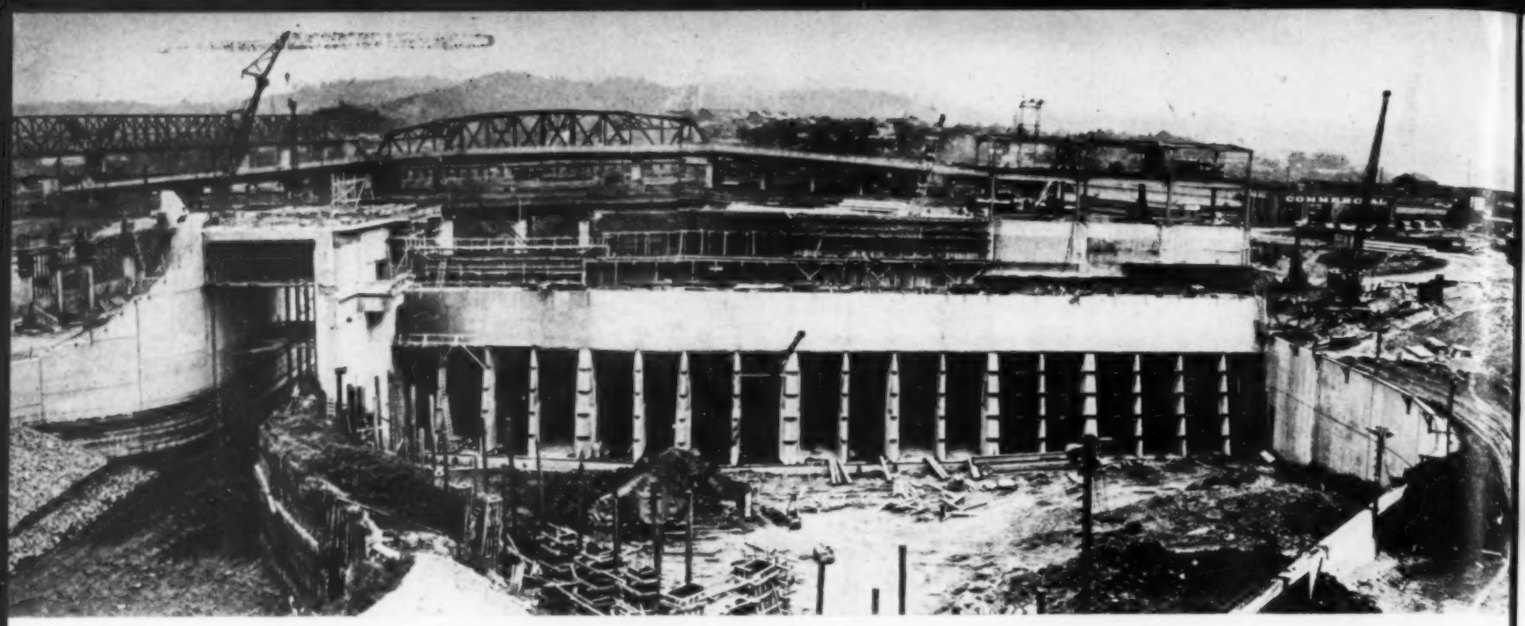
The 60-in. searchlight was the first of the two carbon-arc lights to be brought on the job. Its initial position was on top of the steep left abutment, immediately in front of the two traveling tail towers of the ½-mi.-long twin cableways. After a couple of months in this location, the searchlight was moved to its second position on the head tower at the right abutment of the dam. This move both elevated the light and put it behind the operators of the twin cableways.

In addition, the contractors mounted the Sperry-Aga floodlight on top of an

(Continued on page 134)

60-IN. CARBON-ARC SEARCHLIGHT (below) mounted in first position in front of traveling tail towers on left abutment of dam projects powerful beam which is controlled and focused by hand-wheel adjustment of mirror reflector surface behind carbon arc.

BRIGHT ILLUMINATION (below) on working surfaces of long dam results from use of two carbon-arc lights, each rated at 2,000,000 candlepower.



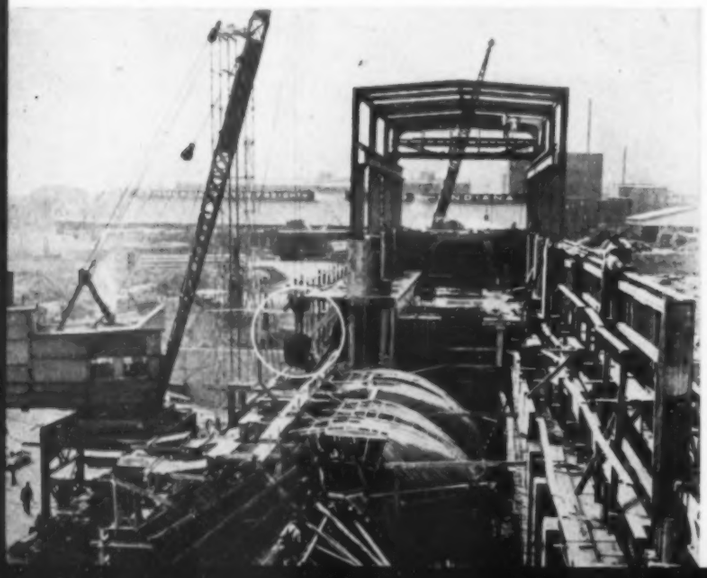
2½ YEARS' WORK goes into construction of flood protection project involving huge discharge bay, at left, and pump station of unprecedented size providing for nine pumps with total capacity of 13,500 cfs. against 29-ft. static head. Erection of trash rack beams has begun in notches of concrete diaphragm walls and piers of pump intakes at right. Behind cofferdam in left foreground, forms are in place for A-frame bents and piers of fender wall. Looking downstream, steel through-truss spans of Sixth St. bridge appear above pump station. In left background is Southern R.R. bridge across Ohio River.

CONSTRUCTION PROGRAM is laid out and directed for contractors by P. C. PETERSON, vice president and manager, LaCrosse Dredging Corp.

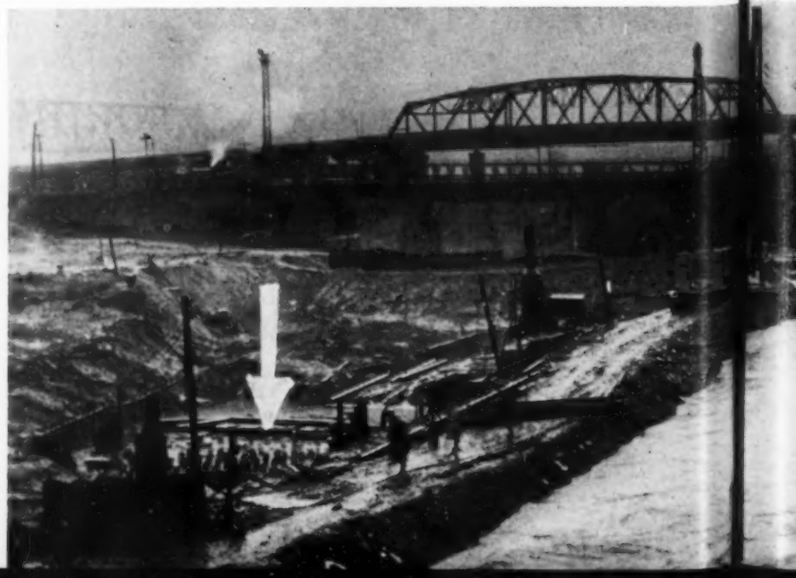
Giant Pump Station GIVES TWO-WAY FLOOD PROTECTION

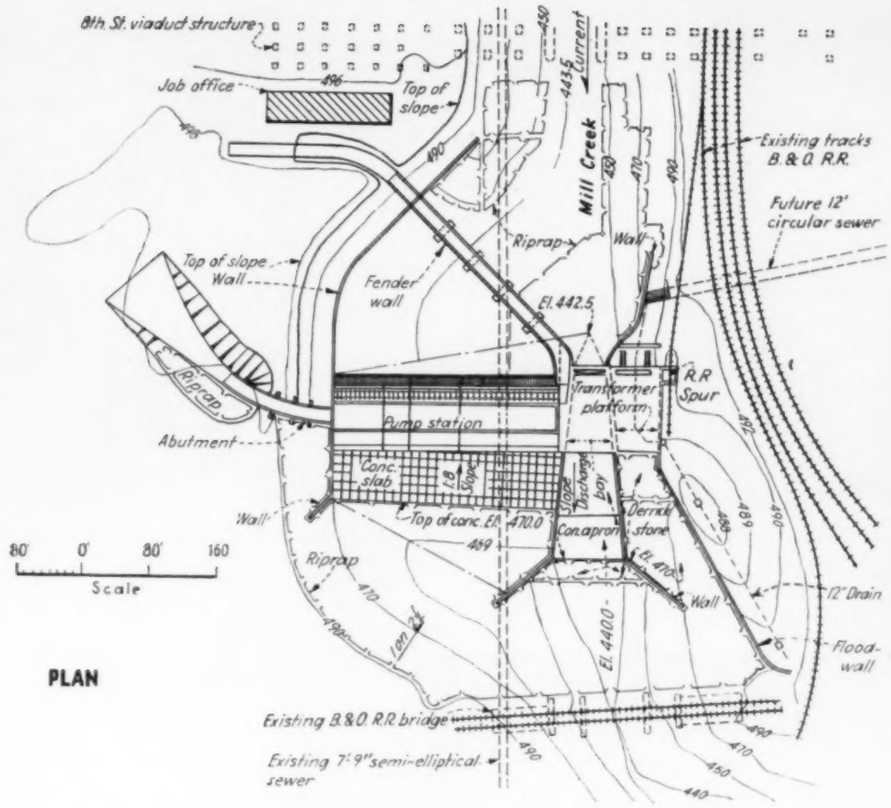
AFTER MORE THAN TWO YEARS of battling high water and difficult foundation conditions, the Ferd J. Robers Construction Co., Burlington, Wis., and the LaCrosse Dredging Corp., Chicago, Ill., joint contractors, have about completed construction for the U. S. Engineers of a barrier dam and pumping station of unprecedented size to protect Mill Creek valley in Cincinnati from backwater of Ohio River floods. Nearly 3,000 precast concrete piles, most of them driven at 3 on 1 batter in alternate directions to resist pressures from either upstream or downstream, support the pump station, floodwalls, fender wall, and a rigid-frame dis-

GANTRY WHIRLEY (below), places 1½-yd. bucket of ready-mixed concrete in forms of diaphragm wall for pump discharge outlet on downstream side of pump station. To right of concrete bucket are partially sheathed pump conduit forms set in place above previously concreted pump barrels. Note painter at work on timber bridge riding on craneway rails inside erected superstructure.

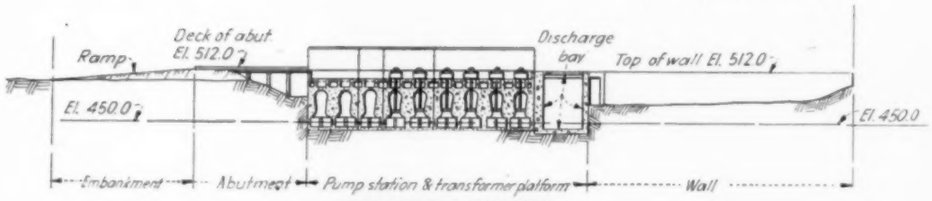


BEFORE FLUME STOP-LOGS are pulled to flood cofferdam in which concrete piles for discharge bay have been driven, as indicated by arrow, mill Creek flood passes around west side of cofferdam



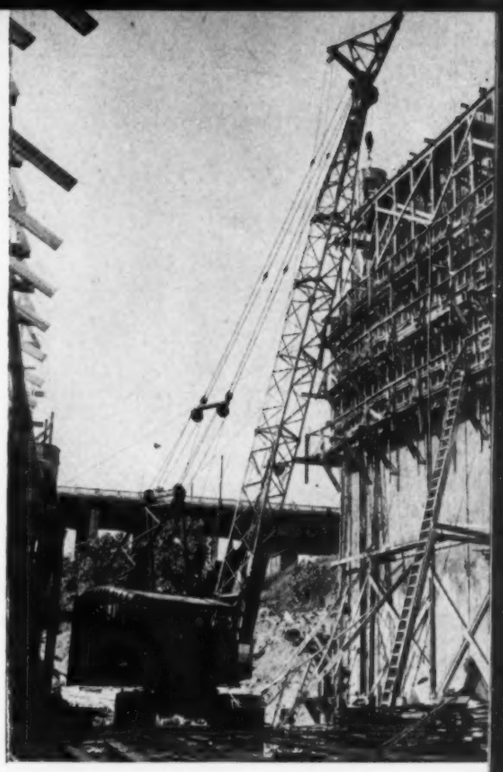


PLAN

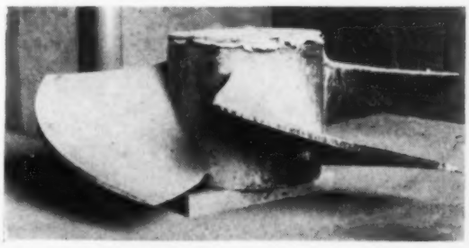


DEVELOPED PROFILE
Along C.L. of Protection Works

FLOOD PROTECTION against Ohio River backwater for Cincinnati's Mill Creek valley is provided by pump station and appurtenant walls built by U. S. Engineers with Ferd J. Robers Construction Co. and LaCrosse Dredging Corp. as joint contractors. Future construction will extend floodwall eastward to protect low part of city adjacent to creek valley. In present construction, contractors first diverted Mill Creek to west of three-sided cofferdam surrounding discharge bay area. After constructing discharge bay inside this cofferdam, contractors returned Mill Creek to new channel and built second cofferdam to permit construction of forebay, fender wall and pump station.



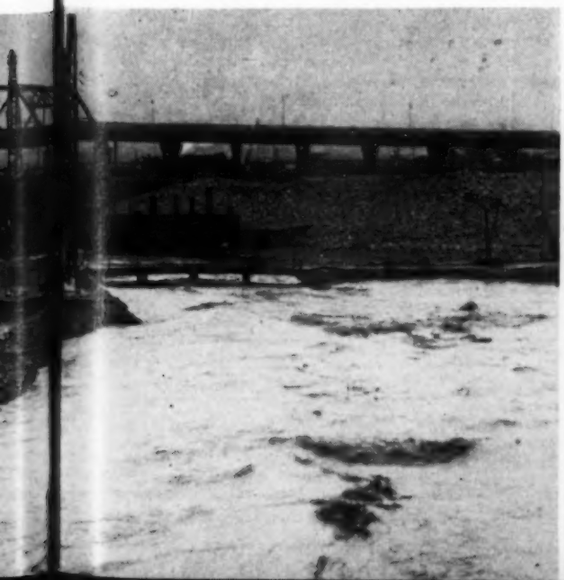
80-FT. BOOM of 40-ton-capacity crane serves to lift 1½-yd. concrete bucket to great height in 70-ft. wall of discharge bay. For higher lifts, crane picks up buckets with 16-ft. jib which gives live boom overall reach of 96 ft.



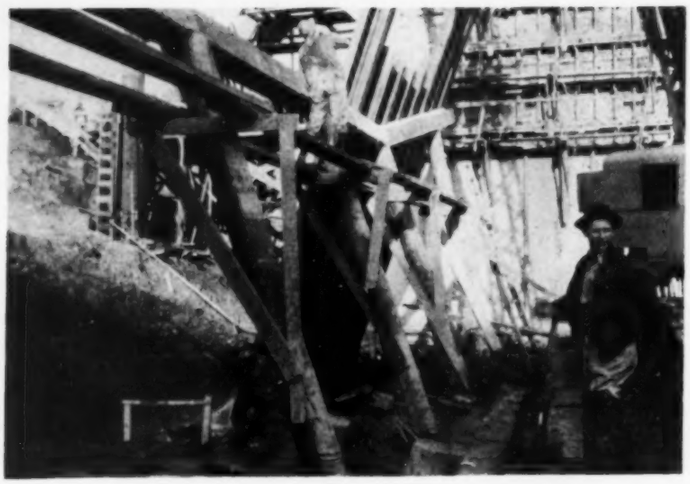
120-IN. IMPELLER rests on wood blocking in intake bay, below pump barrel. Driven by 6,500-hp. electric motor, each of these huge pumps can discharge 1,500 cfs. against 29-ft. static head.

through diversion channel of 5,000-sec.-ft. capacity. Beyond piledriver on dike, note row of steel sheetpiling protecting railroad embankment at approach to [illegible] protection took quite a battering.

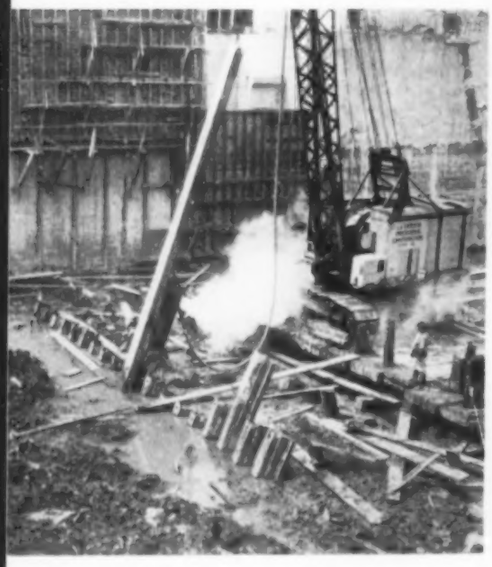
LINES OF WELLPOINTS, indicated by arrows and supplied by Moretrench Corp., control water level in excavated holes for foundations of discharge bay. On bank at far right is wellpoint installation placed there to prevent slumping of sand embankment supporting railroad tracks. In background is 8th St. viaduct, highway crossing over Mill Creek valley for U. S. 50 and Ohio State Route 264.



BY LOWERING BOOM to incline pin-suspended steel leads, crane drives 16-in. octagonal precast concrete pile at 3 on 1 batter. For batter driving, jet pipe travels on guide cable to which it is attached by shackle; cable is strung alongside leads.



PILE-SUPPORTED TIMBER FRAME guides line of steel sheetpiles being driven at 3 on 1 batter for continuous cutoff wall.



FOR FINAL DRIVING of steel sheetpiles at 3 on 1 batter, steam hammer travels on swinging H-beam leads dropped into ground and inclined by crane at proper angle.

ACTIVE SUPERVISION of construction gets direct attention of: (Left to right) **GEORGE M. WOOD**, resident engineer, who previously was in charge of project design; **GEORGE PETERSON**, assistant superintendent for contractors; and **N. G. FASNACHT**, chief of construction operations section, Cincinnati District, U. S. Engineers.

MILL CREEK PUMP STATION

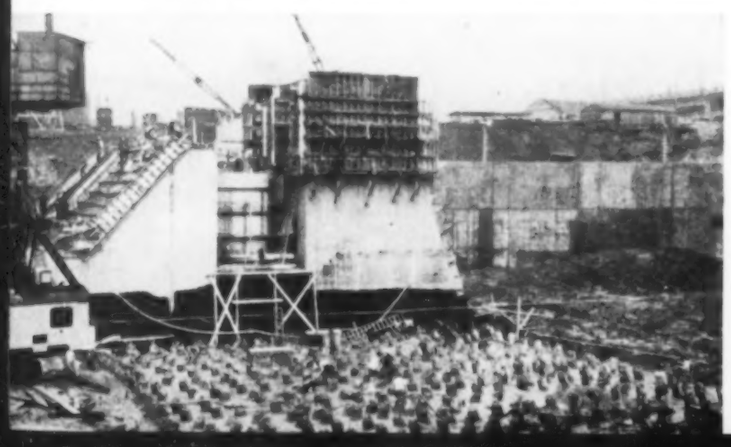
Principal Contract Quantities

Excavation	265,000 cu. yd.
Embankment	21,000 cu. yd.
Compacted backfill	85,000 cu. yd.
Dumped riprap	13,600 cu. yd.
Derrick stone	1,400 cu. yd.
Concrete, class B (5½-bag)	2,000 cu. yd.
Concrete, class C (4½-bag)	43,000 cu. yd.
Reinforcing steel	4,850,000 lb.
Structural steel	950,000 lb.
Precast concrete piles, battered	59,000 lin. ft.
Precast concrete piles, vertical	18,000 lin. ft.
Steel sheetpiling, battered	9,000 sq. ft.
Steel sheetpiling, vertical	21,000 sq. ft.

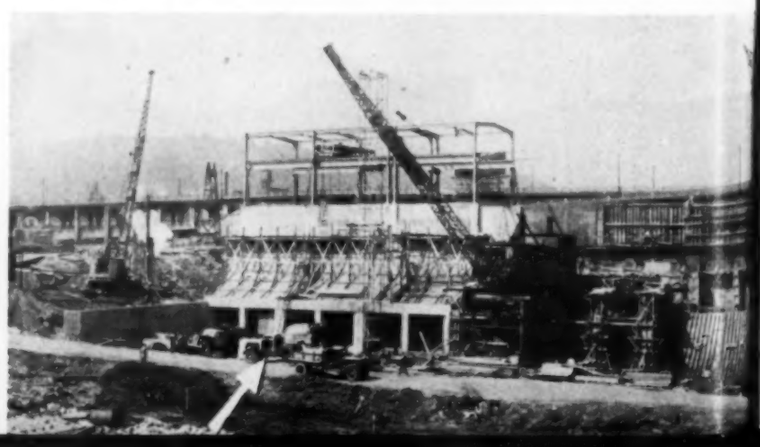
charge bay 70 ft. high through which Mill Creek passes when the Ohio is not in flood. Steel stop-log bulkheads lowered into guide slots of the discharge opening will shut off the valley when the Ohio begins to back up into Mill Creek. At such times the powerful pumps, among the largest in the world, will go into action to lift the Mill Creek flow over the barrier, thus preventing excessive ponding of water behind the dam.

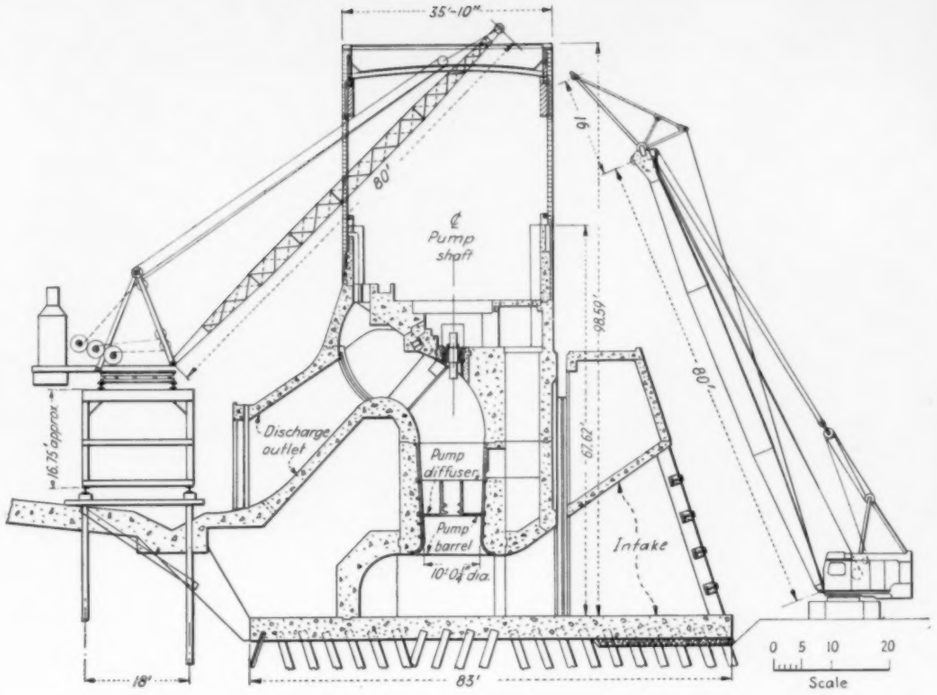
Six cranes played important parts in

PUMP STATION (below) rests on more than 1,100 precast concrete batter piles driven in alternate directions, upstream and downstream, to resist pressure from either side. Electric arc at center of exposed foundation piling shows where welder is attaching rod which projects upward into footing slab. Beyond foundation piling, form is in place for concreting pump barrel.



DOWNSTREAM SIDE of pump station (below) is served by gantry whirley, which has lowered concrete bucket for filling by truck-mixer indicated by arrow. Pump station superstructure has all-welded steel frame, made up of shop-welded frame units. At left, crane is driving vertical steel sheetpile cutoff wall of right abutment.





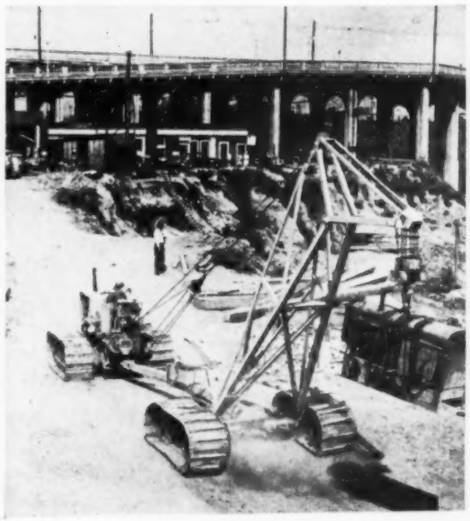
CONSTRUCTION COVERAGE of large pump station structure is obtained with two long-boom cranes, steam whirley mounted on mobile gantry on downstream side and crawler rig with 96-ft. overall reach on upstream side. Latter crane serves also in concreting discharge bay and walls of project.

the successful execution of the work by the contractors. Specially equipped for their various duties, these rigs served in many capacities for dragline and clamshell excavation, for driving of concrete piles and steel sheetpiles, for unloading materials, for placing riprap, and for handling reinforcing steel, structural steel and concrete. An accompanying table lists principal contract quantities. Most of the earthmoving work involved in the contract was sublet to the Richter Transfer Co., Cincinnati, which removed 265,000 cu.yd. of excavation and hauled in 21,000 cu.yd. of material for embankment and 81,000 cu.yd. for backfill. The general contractors took care with their own equipment of earthwork for temporary cofferdams and dikes, foundations and stream channels. Of 2,762 precast concrete piles, 16-in. octagonal, totaling 77,000 lin.ft. in length (an average of 28 ft. per pile), 59,000 lin.ft. was driven at 3 on 1 batter and 18,000 ft. was put down vertically. Under the barrier structures is a continuous steel sheetpile cutoff wall with a surface area of 30,000 sq.ft. of which 9,000 sq.ft. had to be driven at a batter to clear the concrete foundation piles.

An accompanying plan and profile of the pump house and appurtenant works indicate the contours and principal features of the project. The pumping station and floodwalls in the present contract are designed to take care of floods to the 80-ft. stage on the Ohio River gage, the maximum recorded flood level reached in 1937. Flood stage on the river gage at Cincinnati is 52 ft. Actually the top of the walls is 83 ft. above zero on the gage, but the present project is effective for the time being only to the 65-ft. stage, which corresponds to the ground level at the extremity of the walls now being com-

(*Continued on page* 142)

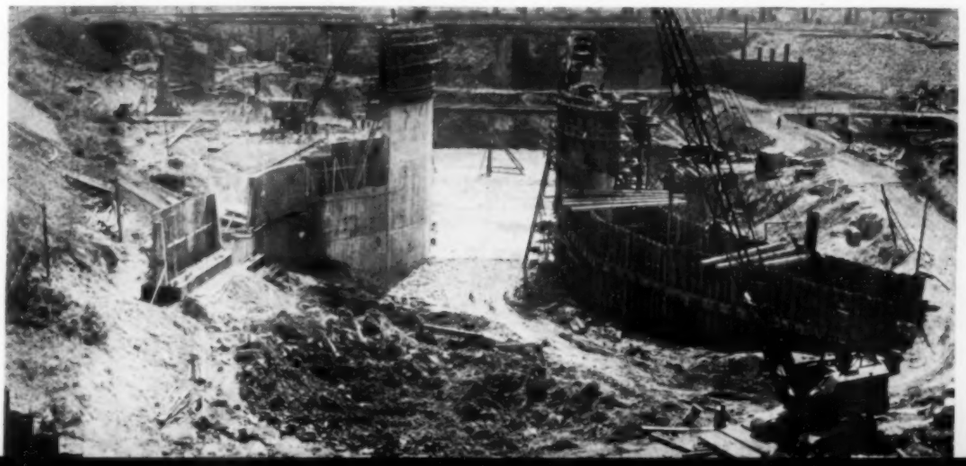
FENDER WALL is made up of reinforced-concrete A-frame bents, for which footings have been placed on 50½-ft. centers, and intermediate fender columns, with 10-ft. clear horizontal openings between concrete units.

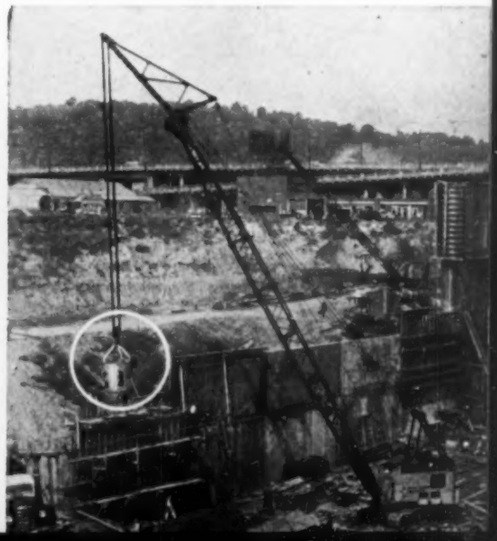


VERSATILE UTILITY UNIT is this tractor crane, mounted on crawler treads, here transporting electric welding set to new location on job.

WITH 96-FT. REACH (below) from heel of power boom to tip of jib, crane of 2-yd. (40-ton) rated capacity handles 1½-yd. concrete bucket into wall forms downstream from discharge bay.

AS DISCHARGE BAY (below) approaches stage at which Mill Creek flow can be turned back into this permanent channel, contractors build steel sheetpile box cofferdam at upstream side, in right foreground, to protect later excavation and construction of forebay, fender wall and pump station.





Track Maintenance

On Santa Fe's 20,853-Mi. System Uses Wide Range of Tools and Equipment

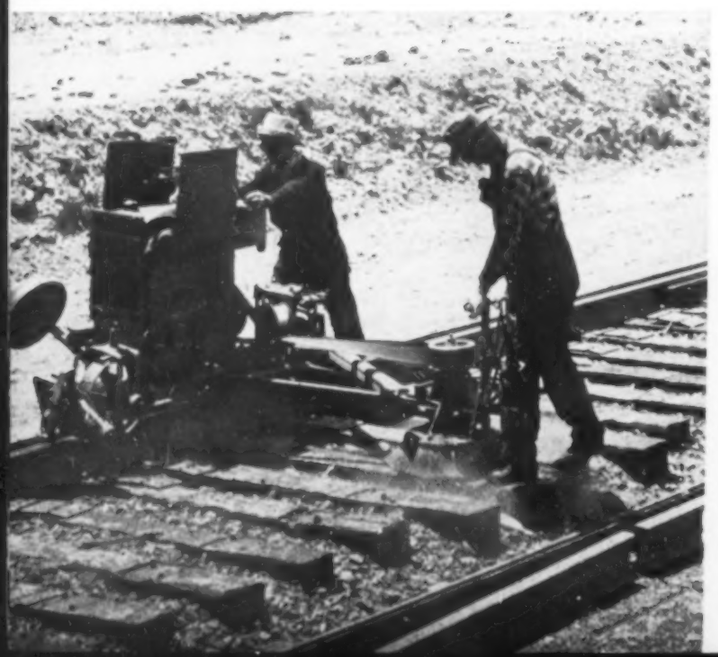
Photos, Santa Fe Railway

FOR MAINTAINING the 13,137 mi. of main line track and an additional 7,716 mi. of secondary line, siding and yard track—a total mileage of 20,853—included in its transcontinental system, the Santa Fe Railway is making effective use of mechanical equipment and hand tools in a wide range of sizes and types to speed progress and minimize costs. In the inventory of equipment items employed by the Santa Fe's track maintenance and construction crews, as illustrated in the accompanying photographs, are: Rail-laying cranes, mechanical spike-pullers and pneumatic spike-driving hammers, mechanical adzers for wood ties, air-operated nut runners or impact wrenches for bolted rail connections, rail grinders, welding machines, rail slot cutters, ballast tampers operated by compressed air, track jacks, creosote heating kettles, rail tongs, grippers, gaging bars, mobile air compressors.

Rails, ties and rock ballast are the back-

NEW SECTION (left) of 131-lb. rail, 39 ft. long and weighing approximately 1,700 lb., is moved over track by rail-laying crane. Workmen of "steel gang" guide it into place.

CREOSOTE HEATER carries preservative which quadruples life of ties and other timbers. Its use on ties makes them last 25 to 30 years.



POWER ADZERS (left) cut new seats in old ties for steel tie-plates on which new rail will rest. Each tie has two plates through which spikes are driven to hold rails.

GRINDER at right (below) sharpens tie adzer bits. Fellow worker at left places them in adzer head.

MECHANICAL SPIKE PULLERS, powered by gasoline engine, operate in pairs, one on each side of rail, as they remove old track spikes.

CREOSOTED WOOD PLUGS are pounded into old spike holes to keep water from seeping in and rotting ties.

SCREEN ON TOP and flaps on side of power adzer head prevent wood chips from flying up and injuring operator.

NEWLY ADZED TIE SEATS are swabbed with hot creosote mixture to preserve wood. Seats are cut same width as tie plate.

ANGLE BARS are spread so rail may slip into place. There are 542 of these bars, which form bolted connections at rail ends, in each mile of track. Grippers (shown in closeup at right) are used by workers to prevent mashed fingers and other injuries.

MOBILE AIR COMPRESSOR (left) furnishes power for air hammer (right) which fits over head of spike, set in place by hand, and drives it firmly into tie.

LINING BAR across track aids in setting rail to gage of 4 ft. 8½ in. which is standard on all tracks.

POWER WRENCH is used to tighten nuts on bolts holding angle bars and rail. This is one of final rail-laying operations.

NEW SLOT IS CUT between rails, following welding and grinding operations, to allow for expansion and contraction.

AFTER WELDING OF TRACK ENDS, grinding crew finishes off weld, smoothing it down to tolerance of 0.01 in. As soon as weld and grind job is completed, it will be checked for accuracy by roadmaster and track will then be ready for ballasting.

bone of a railroad, and track construction and maintenance represent a continuous and costly feature of railway operation. On the Santa Fe system, extending from Chicago to the Pacific Coast and south to the Gulf of Mexico, with lines radiating to all parts of the Southwest, rail sizes and weights range from 52 lb. to the yard, used in very early construction, to the massive 131-lb. rail, now standard for high-speed transcontinental main line. For the larger 131-lb. size each 39-ft. long rail weighs 1,703 lb. Wood ties supporting the rails are spaced to average from 3,250 to 3,520 to a mile.

Ties, which formerly had to be replaced every six or seven years, are now good for 30, due to treatment with a mixture consisting of 50 per cent creosote and 50 per cent petroleum residuum or fuel oil. All poles, crossing plank, bridge and foundation timbers are similarly treated to prevent decay. Tie turnover is now 2,-

(*Continued on page* 134)

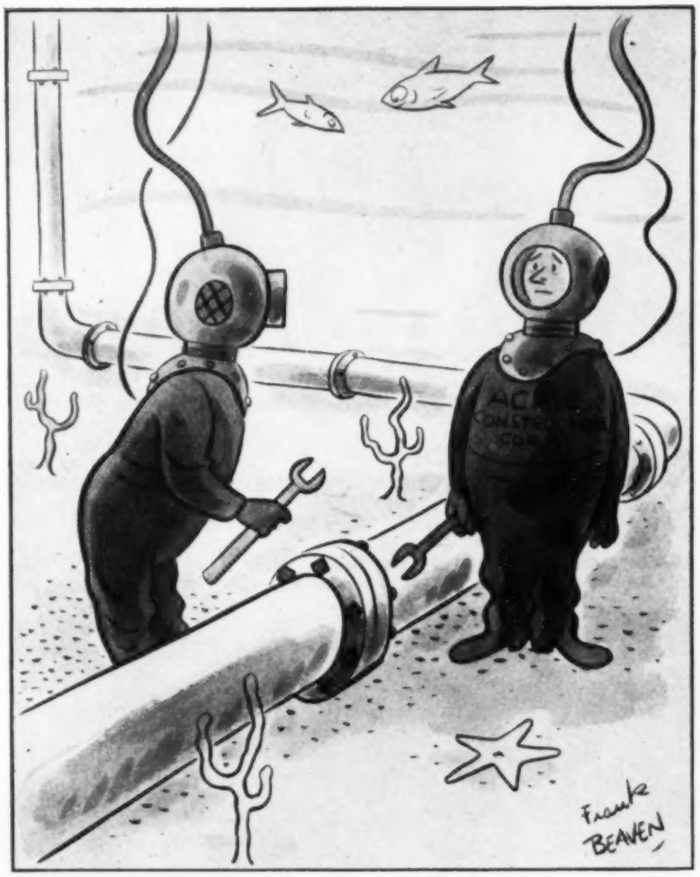
RAIL IS LIFTED 5 in. with power jacks (below) so new ballast can be tamped under ties. Device across track holds rail to maintain proper gage.

BALLAST IS TAMPED between ties with air hammers (below). Crushed rock is considered best material for ballast, but other materials which are commonly used include cinders, chats, oyster shell, gravel, volcanic ash, and iron slag.

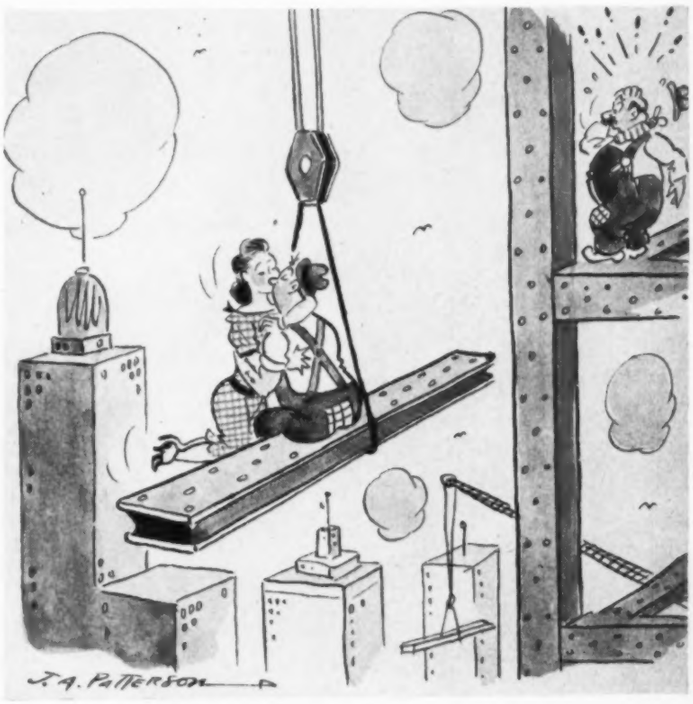
THE JOB JESTER

CARTOONS DRAWN FOR CONSTRUCTION METHODS

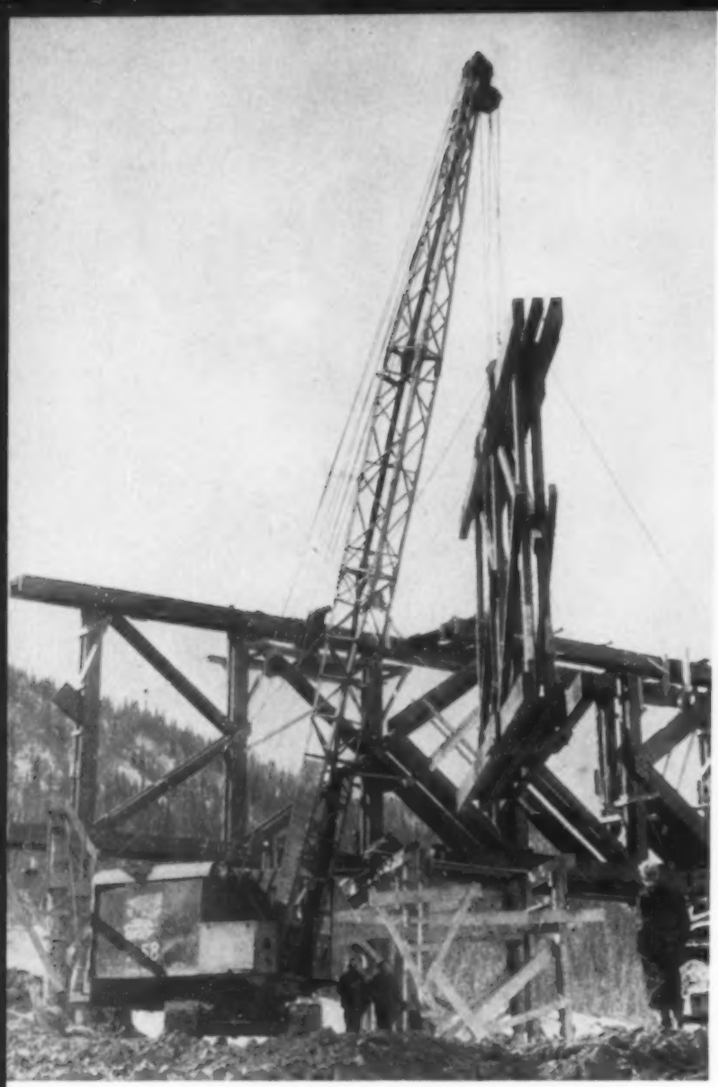
"Now, remember . . . crawl through the tunnel and pop your head out at the other end. Then when they see you, yell 'April Fool!' "



"I told them yesterday to stop the air pump when the garbage scow goes by."



"I think I hear the whistle to start back to work, sweetheart. You better go now."

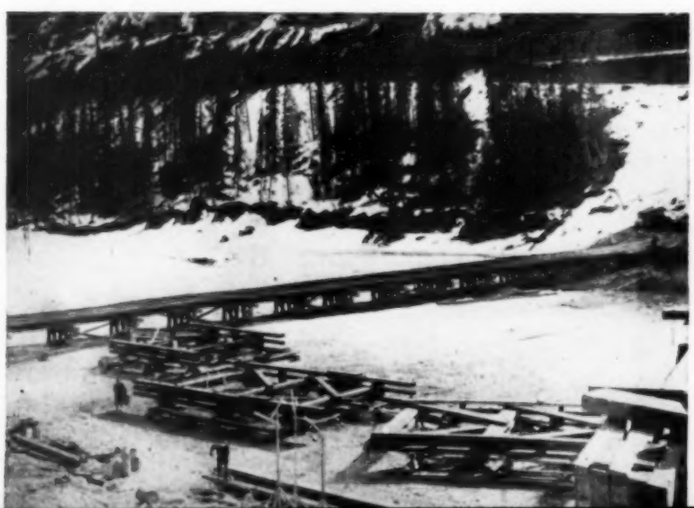


ASSEMBLED SECTION of treated timber truss is lifted by crane and (below) lowered into position on falsework.

Three-Span Bridge With *Treated Wood Trusses* Built on Alaska Highway

By S. W. POWELL, *Resident Engineer, Public Roads Administration*

SUB-ASSEMBLY (below) of treated timber trusses is accomplished on river ice. Fabricated on skids, they can be easily pulled within reach of crane.



THREE-SPAN BRIDGE crosses Sikanni Chief River on Alaska Highway. At far end is west bank where road from north enters bridge on 78-ft. tangent.

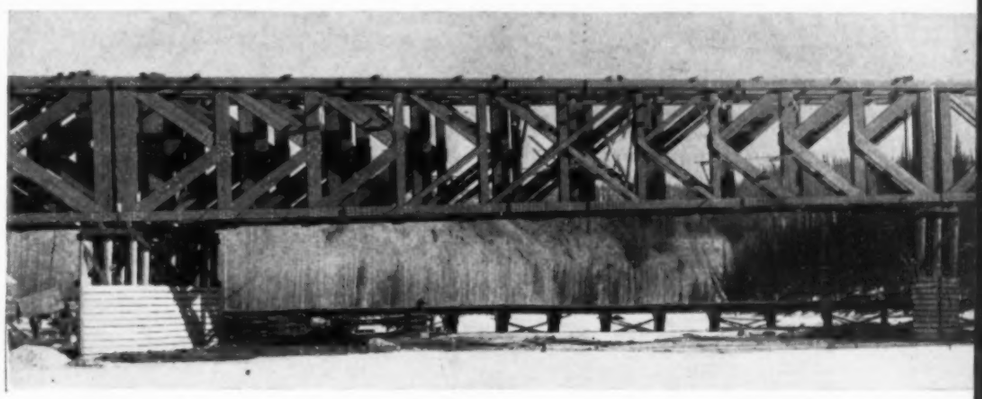
SPANNING RIVER about 50 ft. downstream from new structure is temporary Army bridge, 255 ft. long. On north bank is Pederson Construction Co. camp.

Photos by Public Roads Administration

BUILT TO REPLACE a temporary one-way log-frame-bent Army bridge, the new Sikanni Chief River Bridge now forms a permanent link on the Alaska Highway at Army Mile 116 from Fort St. John in British Columbia and about 164 mi. from the beginning of the highway at Dawson Creek, B. C. It consists of three spans, 144 ft. c. to c. of piers measured along the grade line of the bridge, with three-bent pile trestle for the east approach and five-bent pile trestle for the west approach, making a total length of 584 ft. The roadway is 24 ft. wide.

Each span consists of four 140-ft. deck K trusses, framed with treated Douglas fir timber. Split-ring connectors were used in framing. Fir timber imported

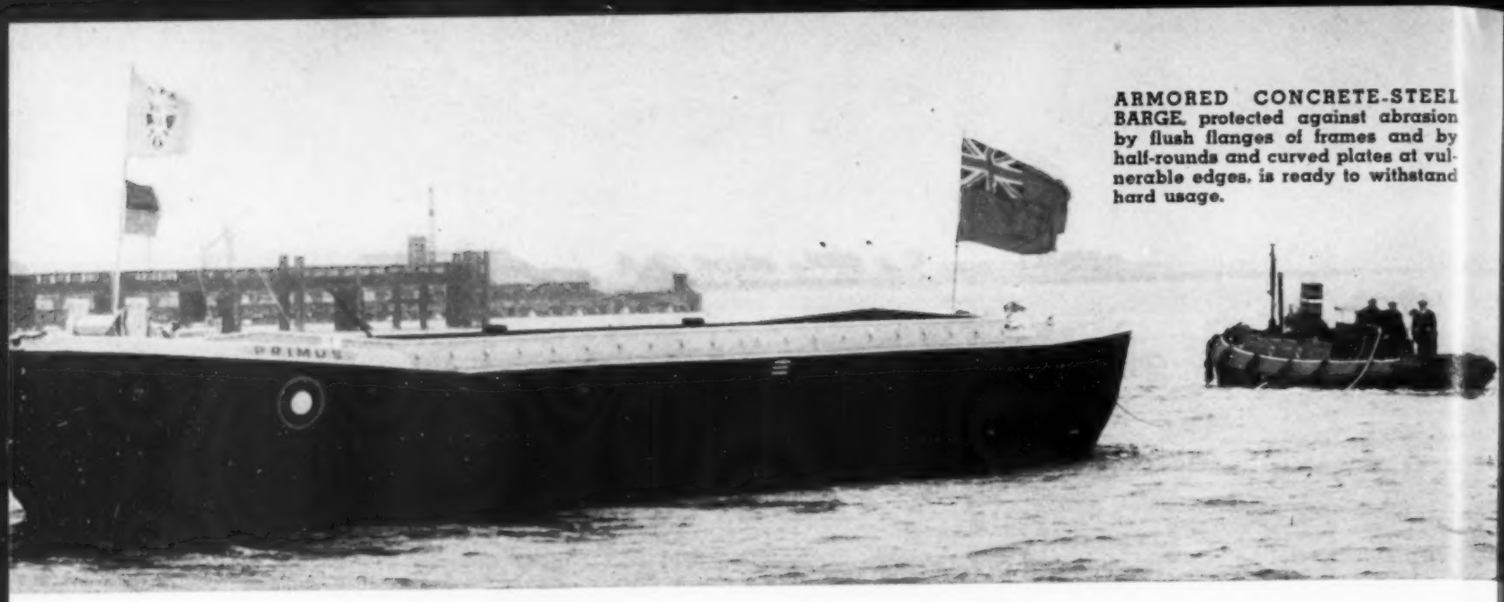
(*Continued on page* 102)



MAIN SPAN, seen from upstream side, consists of four 140-ft. deck K trusses, framed with treated Douglas fir timber.

CRANE IS AT WORK (below) in treated timber stockyard near north approach of Alaska highway.

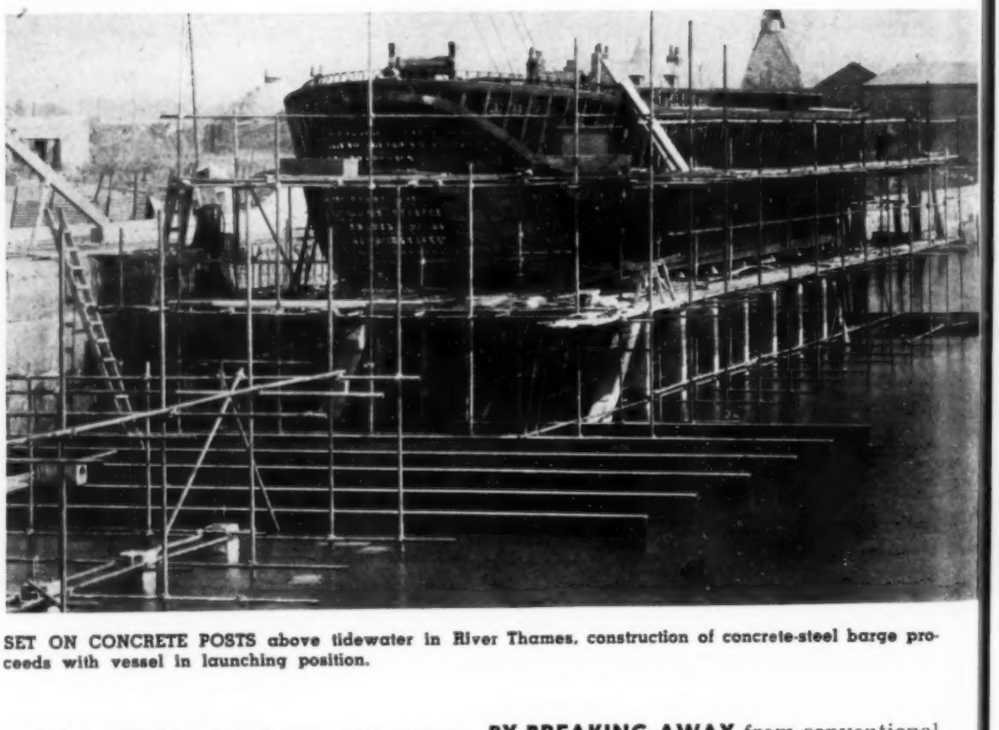
NATIVE SPRUCE (below) in 26-ft. lengths is used for flooring north approach span of new bridge.



ARMORED CONCRETE-STEEL BARGE, protected against abrasion by flush flanges of frames and by half-rounds and curved plates at vulnerable edges, is ready to withstand hard usage.

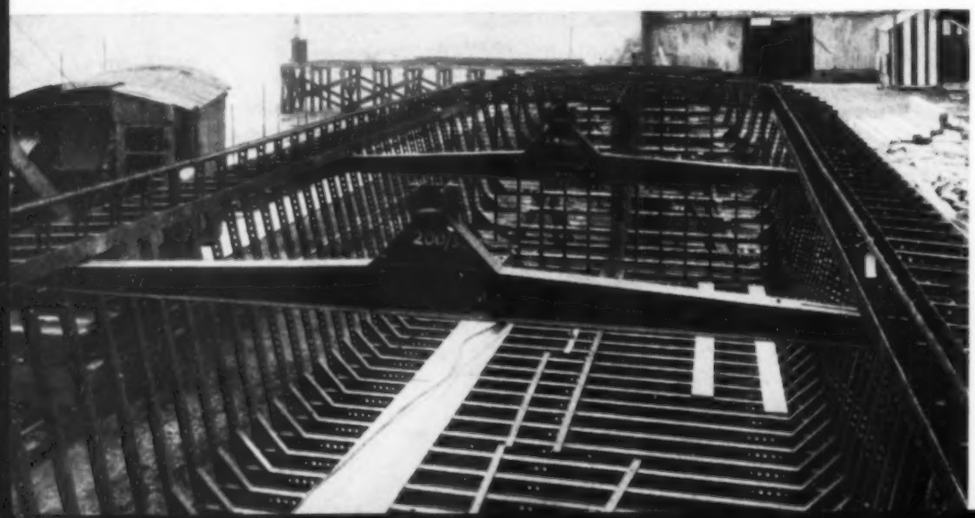
Lightweight Concrete-Steel Barges

ARMORED AGAINST HARD SERVICE



SET ON CONCRETE POSTS above tidewater in River Thames, construction of concrete-steel barge proceeds with vessel in launching position.

BARGE SKELETON (below) of welded transverse frames first is assembled on land, prior to being lifted in sections on to concrete posts over water, where construction is completed.



BY BREAKING AWAY from conventional practices of reinforced-concrete design, builders of concrete-steel barges on the River Thames, London, England, have produced vessels of 200 and 400 long tons cargo capacity comparing favorably with all-steel barges. The new design makes use of closely spaced transverse welded frames of light-section rolled steel shapes with webs perforated at close intervals and longitudinal reinforcing rods threaded through the perforations. Between the frames, the hull of the barge consists of lightweight concrete, containing incinerated clay aggregate, placed flush with the inner and outer surfaces of the flanges of the steel members, leaving the steel exposed to armor the barge against abrasion on either the outside or inside. The barges have been built in accordance

with designs and supervision of Sir Owen Williams and Partners, Stanmore, England. British patent rights have been granted for the new method of ship construction, and American and other rights are pending.

New Design Conserves Steel

At a saving of almost two-thirds of the metal required for all-steel barges of equivalent capacity, the new construction produces vessels which are staunch and serviceable against all conditions of hard usage. Steel plate is required only in minor quantities for a few items, such as longitudinal plates and protection of vulnerable edges. Overall strength of the barges is sufficient to prevent damage under any conditions of grounding. Flush construction, by eliminating pockets between frame ribs, provides advantages in cargo handling, and eliminates need for timber "ceilings," required in all-steel barges for certain types of cargo.

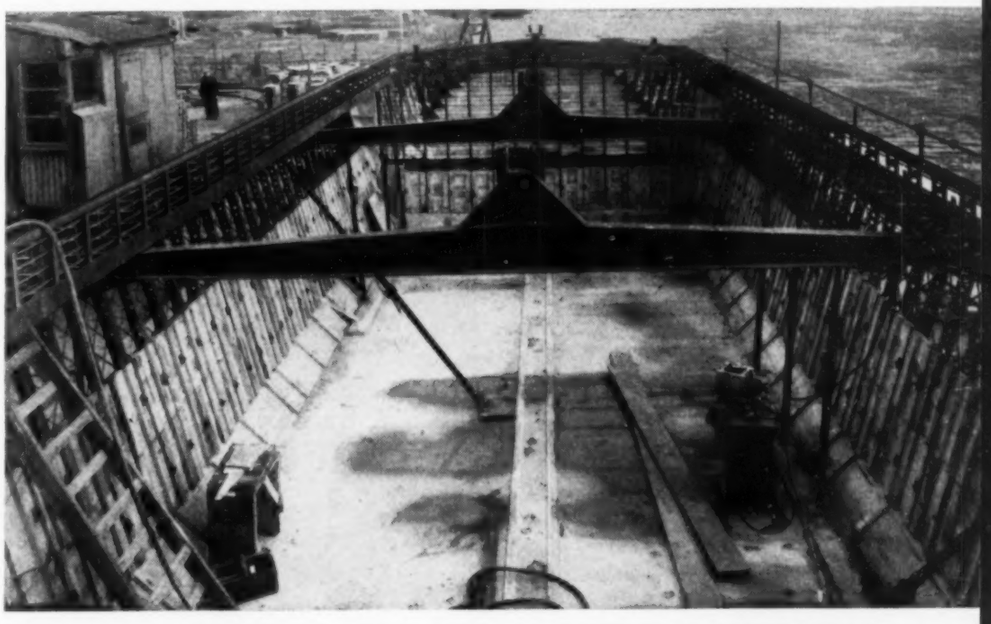
Use of lightweight concrete in the hull panels between the steel frames gives a total weight of steel and concrete only slightly greater than that of an all-steel barge. Anchoring the form panels to the closely spaced steel frames prevents spreading of the forms and resultant creation of excess bulk and weight.

Concrete Mix

Concrete used in the barges is a 1:1½ mix of cement and incinerated clay, designed to give guaranteed compressive strength tests of 4,000, 6,000 and 8,000 psi. at 7, 28 and 90 days, respectively. In permeability tests, slabs 2 in. thick are required to pass 4 days under 30-lb. water pressure without penetration. During early construction of barges, the weight of the concrete was 115 lb. per cu.ft. Later improvements in the aggregate have reduced the weight to 96 lb. per cu.ft. Exhaustive tests were made to

(*Continued on page* 100)

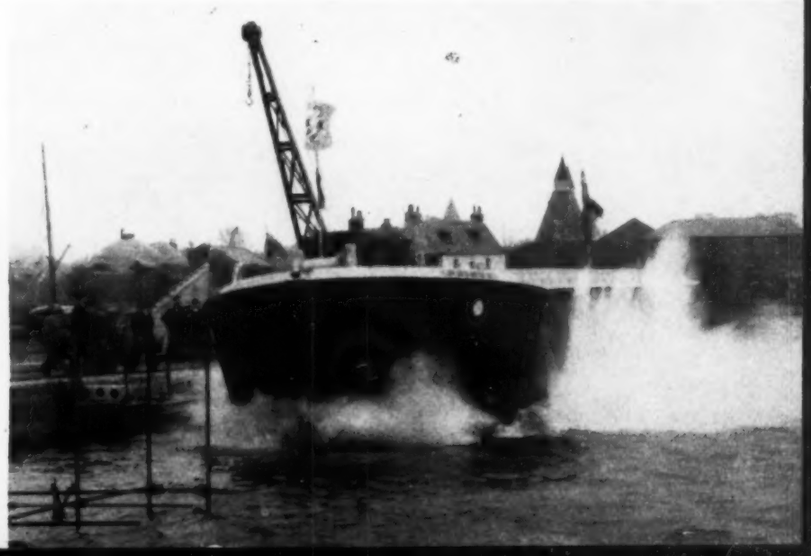
REINFORCING RODS, threaded through web perforations in rolled steel shapes of welded transverse frames, tie structure together longitudinally after lightweight concrete is placed between frames.



FORM PANELS bolted tight against flanges of steel frame members confine lightweight concrete to space between frames, leaving flanges exposed to armor barge on both outside and inside.

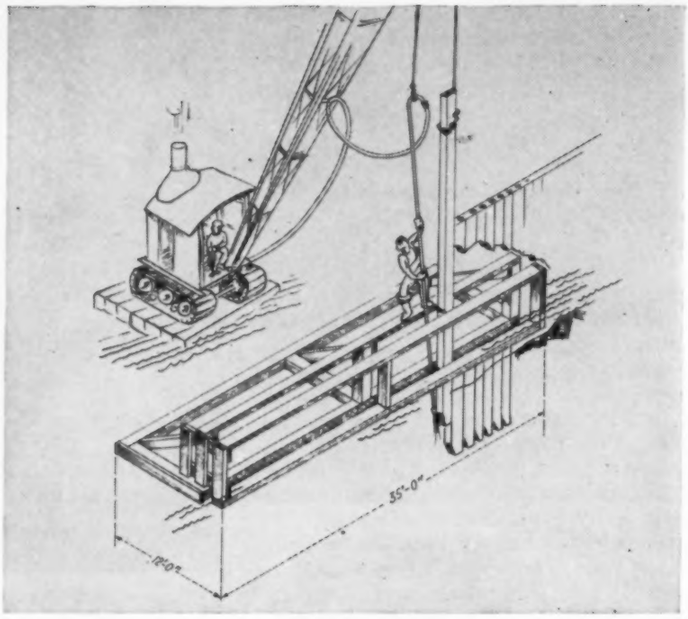
AFTER HULL (below) has been coated with bituminous paint, barge is launched by pushing outward with hand-operated jacks until concrete posts topple over and barge drops into water.

JACKED OUTWARD (below) 6 in. to overturn 12-in. concrete posts, barge falls into River Thames. Synchronized operation of jacks causes posts to overturn evenly and uniformly.



SOMEWHERE IN NEW GUINEA bridge-building operations of U. S. Army Engineers are speeded up by boring holes for bolted connections in timber stringers with Ingersoll-Rand wood auger, powered by compressed air.

Army Signal Corps Photo



MOVABLE GUIDE FRAME replaces ordinary bracing in jetting and driving creosoted timber sheetpiles for 2,850 ft. of curved bulkhead laid out in chords 27-33 ft. long on contract of Charles F. Vachris, Inc., Brooklyn, for Department of Parks, New York City, at Great Kills Harbor in park of that name, Staten Island. Crane lifts frame into position and weights it down against tide action. To accommodate sheetpiles varying in size for this job from 5x12 in. by 18 ft. to 12x12 in. by 34 ft., guide slot of frame is adjustable to various pile thicknesses. Each sheetpile is held in against previously driven sheeting at top and bottom of frame to prevent spreading as pile is first jetted to prescribed depth and then driven to final grade. Originally suggested by CHARLES VACHRIS, movable frame was designed by ROBERT J. CIKA, contractor's chief engineer, who later drew this sketch for "Construction Methods."

HOW They Did It

CONSTRUCTION DETAILS For Superintendents and Foremen

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POLE ERECTION (below) for 100-mi. power transmission line from Shasta Dam to Oroville, Calif., is done with aid of tractor-operated crane with welded steel boom mounted on single pneumatic-tired axle. Connections are made to system of Pacific Gas & Electric Co. which holds temporary war-time contract with U. S. Bureau of Reclamation for output of plant's first two 75,000-kw. generator units.

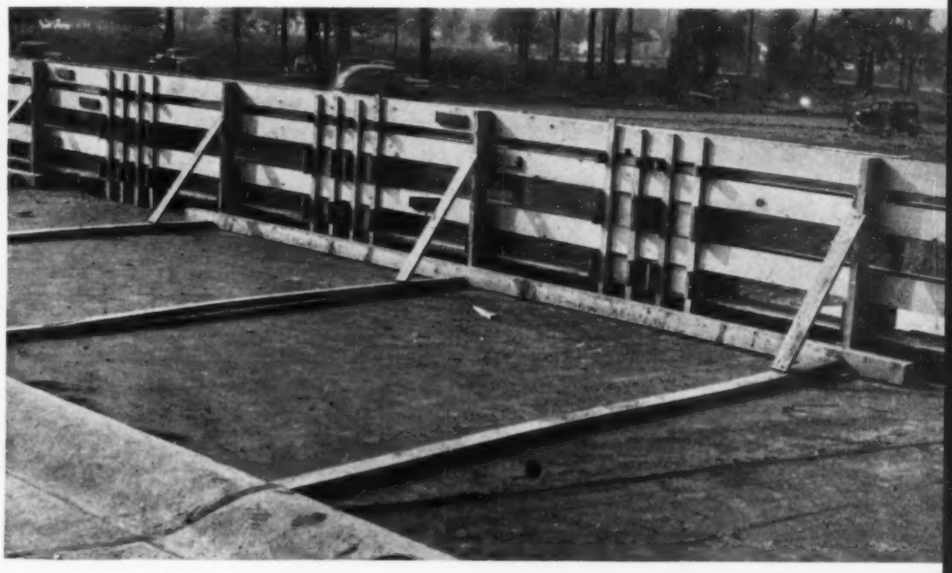
BALANCED STEEL ERECTION (below) by cantilever method, using two traveling derricks working outward in opposite directions from river pier, was employed by Massman Construction Co. in building new Mississippi River highway bridge, 3,627 ft. long, at Jefferson Barracks, below St. Louis, Mo. Center span of 804 ft. is flanked on each side by 670-ft. span connecting with approach spans from Missouri and Illinois sides. Temporary support was provided by steel falsework bents carried on 75-ft. timber bearing piles.

STEEL GRATING on ditch culvert of Erie R. R. at Salamanca, N. Y., intercepts debris rolling down sloping highway approach to railroad crossing and prevents dislodged stones from reaching tracks. Irving Subway Grating Co., Long Island City, N. Y., supplied culvert grating.

SAFETY SIGNBOARD at workers' entrance to Norfork Dam, being built by Utah Construction Co. and Morrison-Knudsen, Inc., for U. S. Engineers in Arkansas, impresses accident consciousness on minds of incoming employees. Curves on chart show job record of accident severity and frequency.

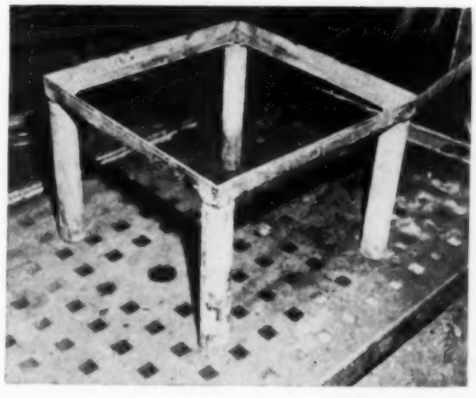
AIR-POWERED CIRCULAR SAW, served by truck-mounted Le Roi compressor, cuts timber for bridge built in Italy by U. S. Army Engineers.

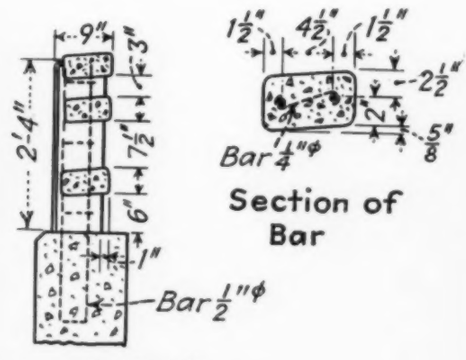
Corps of Engineers Official Photo



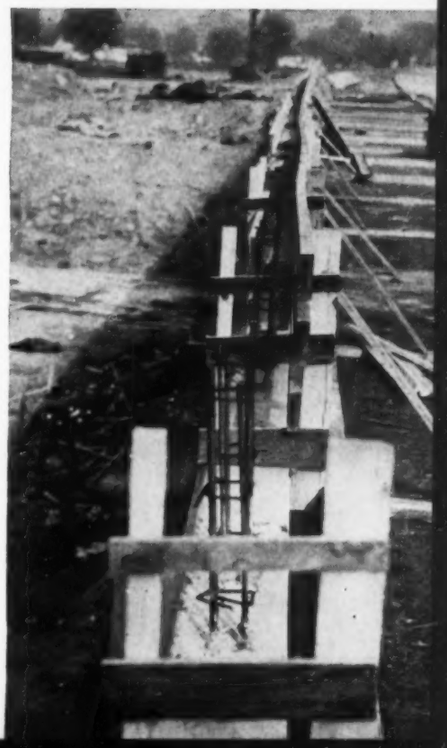
WOODEN FORMS (above, right and below) milled to exact shape of cast-in-place concrete railing are erected by Bryant & Detwiler, contractor, Detroit, on bridge to carry one of divided roadways of Detroit Industrial Expressway over Southfield Road. Cast-in-place railings are typical of all highway grade separation bridges constructed on this modern freeway by Michigan State Highway Department.

OXY-ACETYLENE CUTTING TABLE (below) is made from short scrap ends of tubing and scrap angle iron tacked together by arc welding. Designed in R. G. LeTourneau, Inc., maintenance plant, table was winner in Hobart Bros. Co. arc welding news contest.

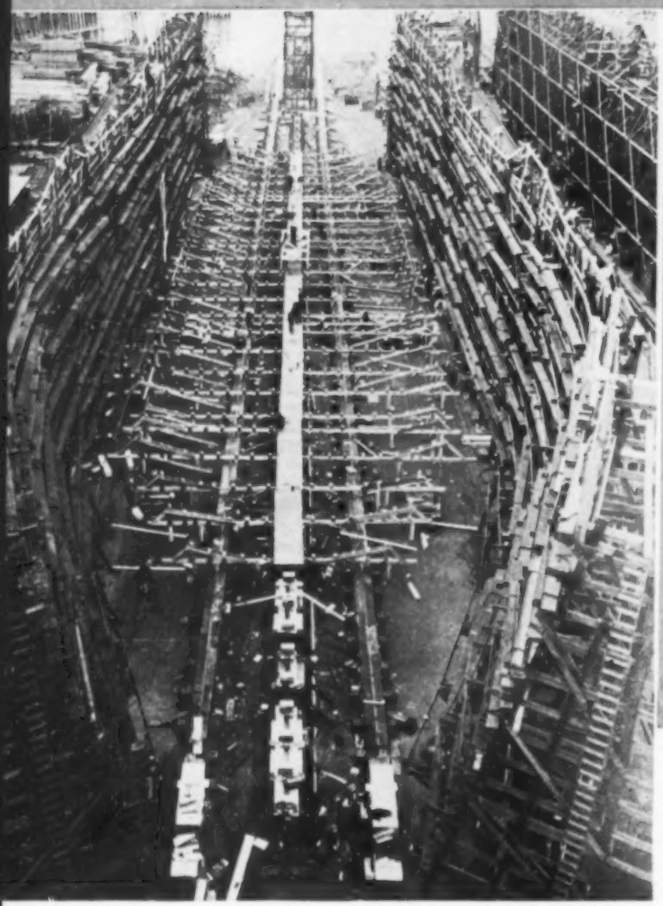




Concrete Railing



New Victory Ship, BETTER THAN LIBERTY TYPE, IS U. S. MARITIME COMMISSION'S LATEST CARGO CARRIER FOR WAR SERVICE



LOOKING AFT, this view of construction shows flat keel and temporary inner-bottom scaffolding.

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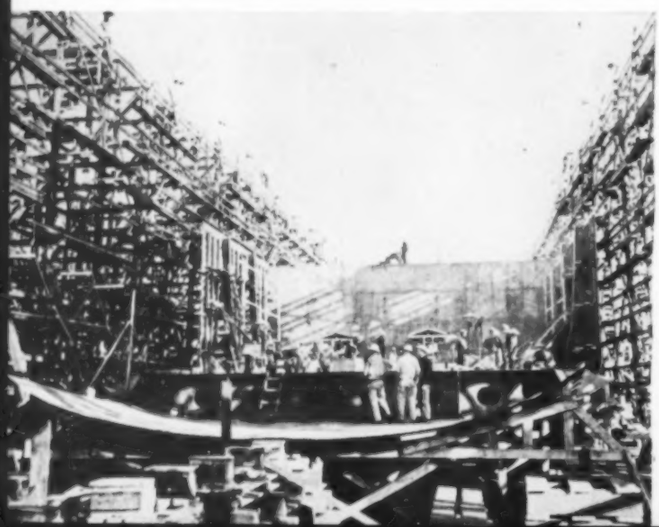
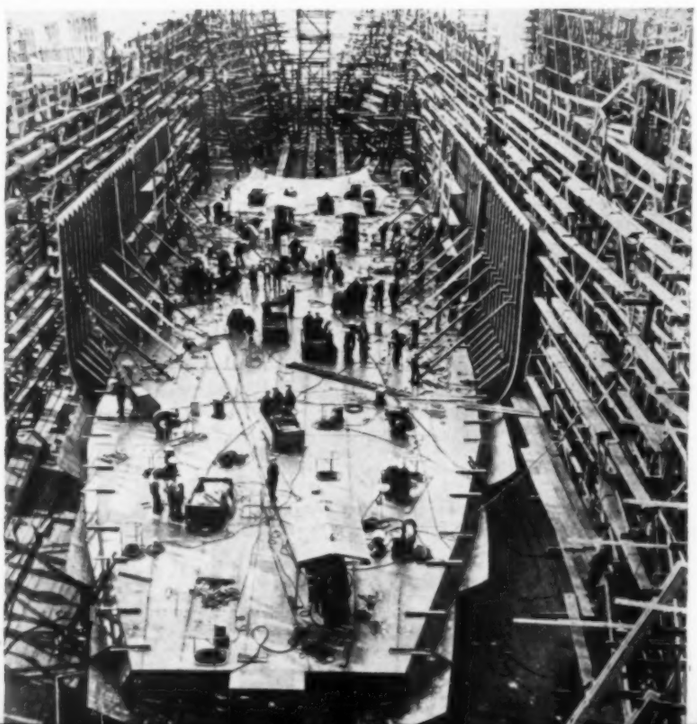
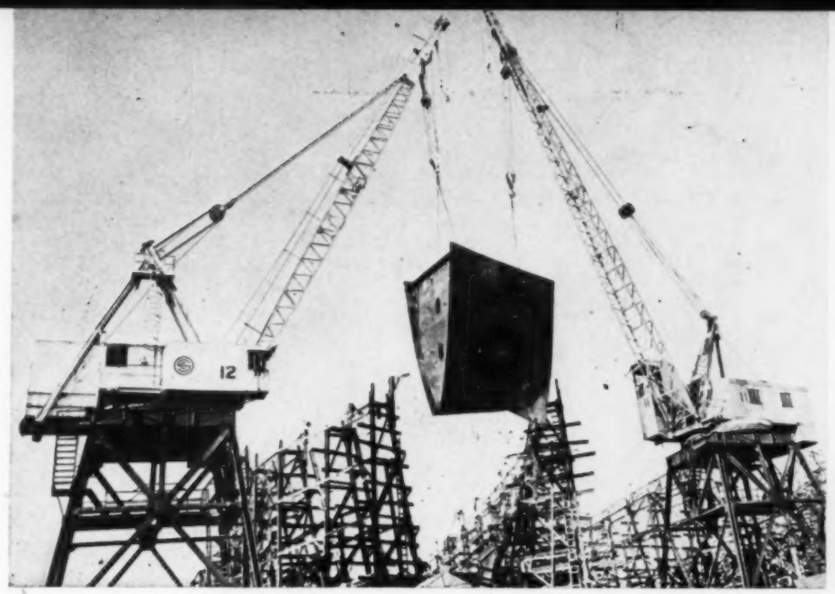
LOOKING FORWARD (below), installation is under way on one of vessel's steel bulkheads.

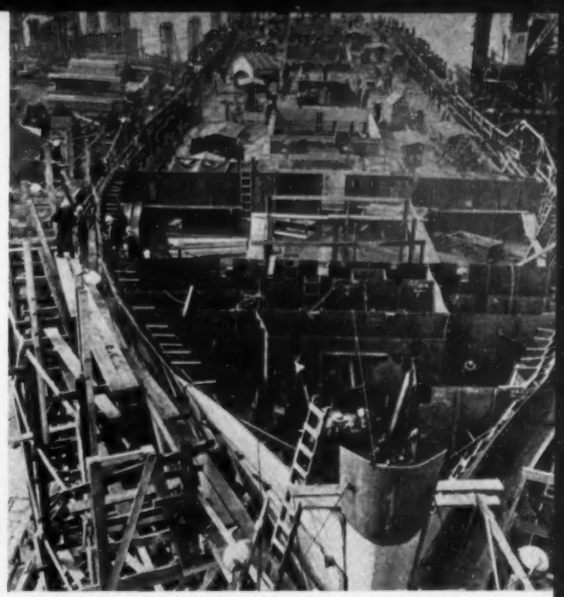


WELDING OPERATIONS (below) are here in progress on inner bottom sections, shell and frame sections.





PREFABRICATED ASSEMBLY of forepeak tank section is swung into place by two 40-ton revolving cranes atop movable gantries.



FO'CASTLE BULKHEADS and chain locker, looking aft, showing ship in advanced stage of construction.

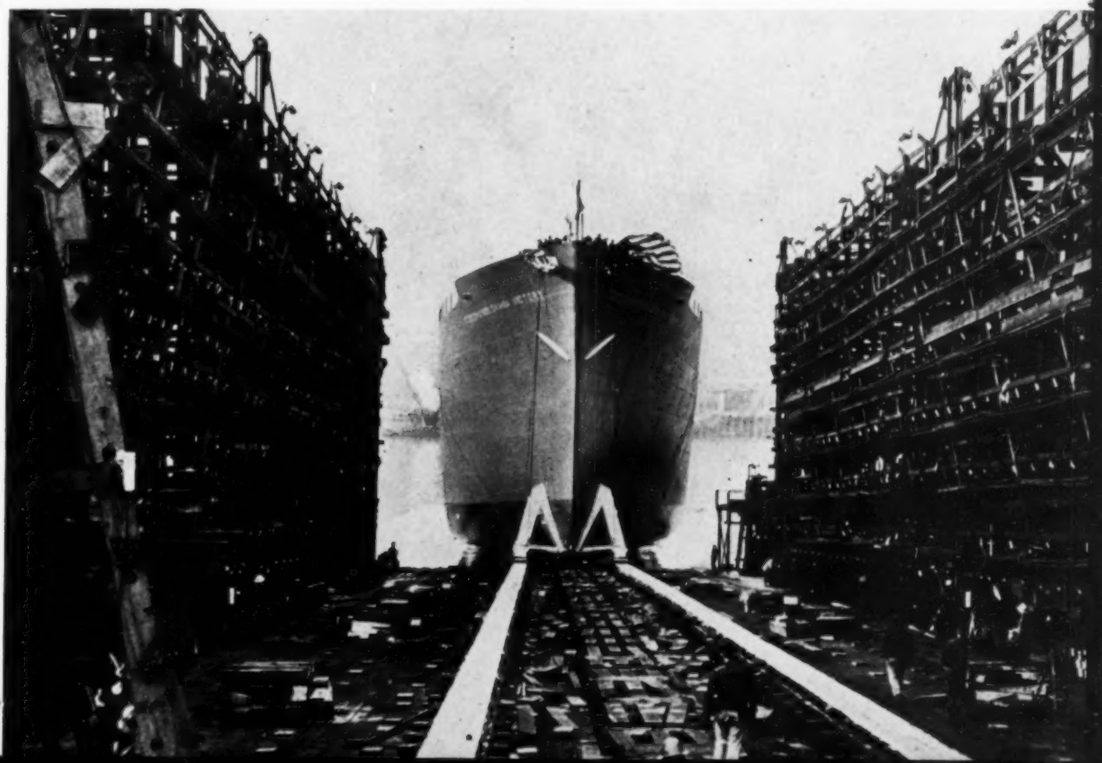
EMBODYING CHANGES IN DESIGN to produce finer hull lines, greater cruising speeds and slight increases in overall length and beam, the new steel Victory ships being built for the U. S. Maritime Commission at a number of shipyards throughout the United States are more efficient cargo-carrying vessels than their prototypes, the Liberty ships, which have been produced in large quantities by prefabrication and mass assembly methods during the last two years. While welding is largely used in fabricating the Victory ship, certain of its steel plates are riveted.

Principal dimensions of the Victory type vessel are: Overall length, 455 ft.; beam, 65 ft. Corresponding dimensions for the Liberty ship are: Overall length, 441½ ft.; beam, 57 ft. Deadweight tonnages for the two models are substantially the same—10,500 and 10,800—but the Victory model is a faster vessel, with a speed of 15 knots as against 11 knots for the Liberty unit. The newer ships have three decks, while the older vessels have only two decks. The newer model is equipped with steam turbine-gear propulsion, while the older is driven by single-screw triple-expansion reciprocating steam engines.

The first of the new Victory ships, *United Victory*, was completed and launched Jan. 12, 1944 at the Pacific Coast yards of the Oregon Shipbuilding Corp. Construction of both types of cargo carrier involves speedy mass-production methods by which large prefabricated assemblies are welded into complete units at shops or "assembly areas" adjacent to the ways to which they are delivered and hoisted into place by large cranes for incorporation in the completed hull and superstructure.

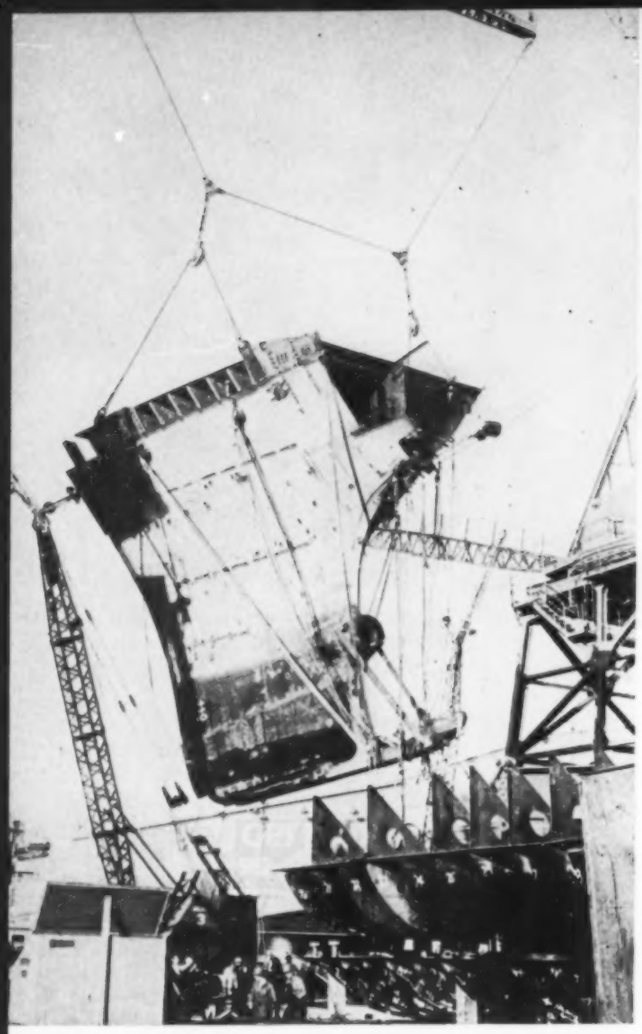
The accompanying photographs, supplied by the U. S. Maritime Commission, illustrate various stages in the construction of both Victory and Liberty ships, scores of the latter type now being veterans in war service. Chief characteristics of both types of ship, as conceived in the original and revised plans, are minimum cost, rapidity of construction due to adaptability to mass production methods and simplicity of operation.

These pictures of new Victory ship construction are followed, on the next two pages, by photographs illustrating the building of the older type of Liberty ship.



SLIDING DOWN WAYS (right), steel Victory ship hits water at one of numerous yards now producing this new type of cargo carrier.

Photos,
U.S. Maritime Commission

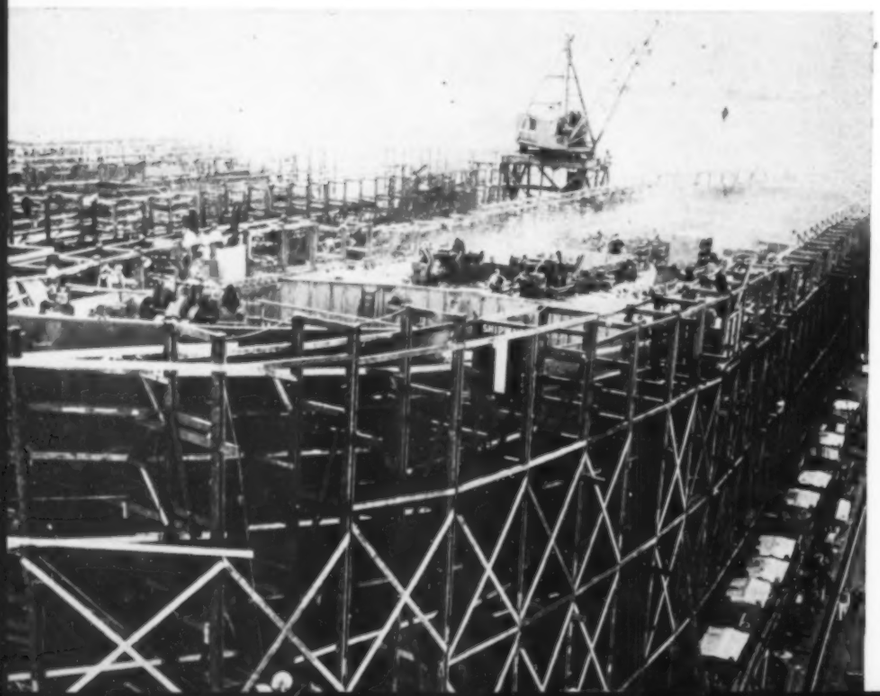


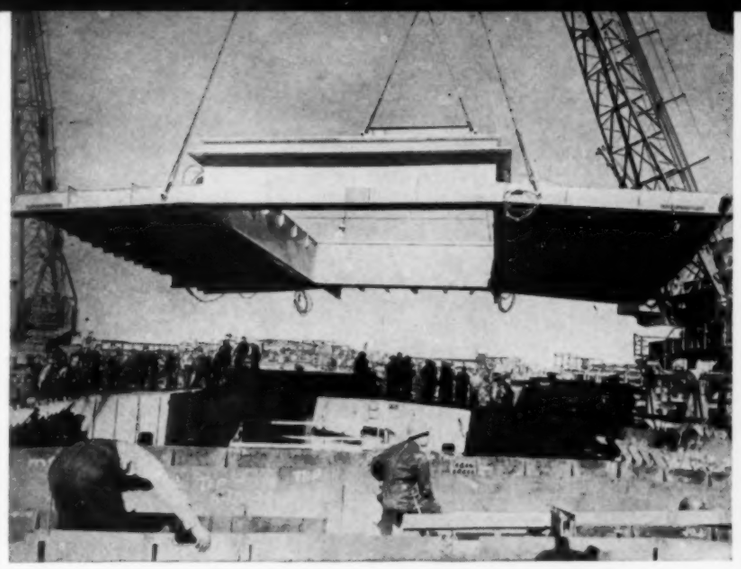
AFTERPEAK ASSEMBLY, a heavy welded section, is brought up by cranes for installation on shipways.

TRANSPORTATION of welded assembly is here handled by heavy-duty 16-wheel trailer hauled by Caterpillar diesel wheel tractor.

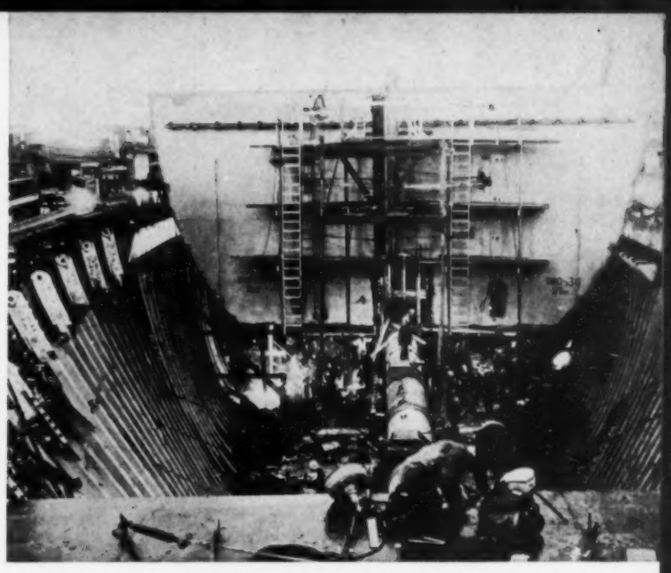
LIBERTY SHIP PROGRAM DEVELOPED *New Technique* OF WELDED PREFABRICATION AND MASS PRODUCTION

NEARING COMPLETION (below). Liberty ship "Robert E. Peary" has reached stage where main deck has been installed 59 hr. after keel laying.

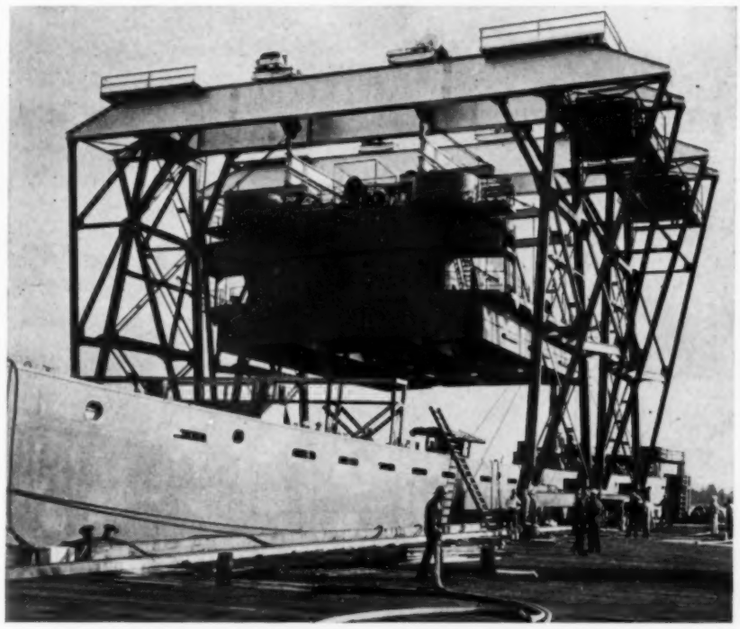




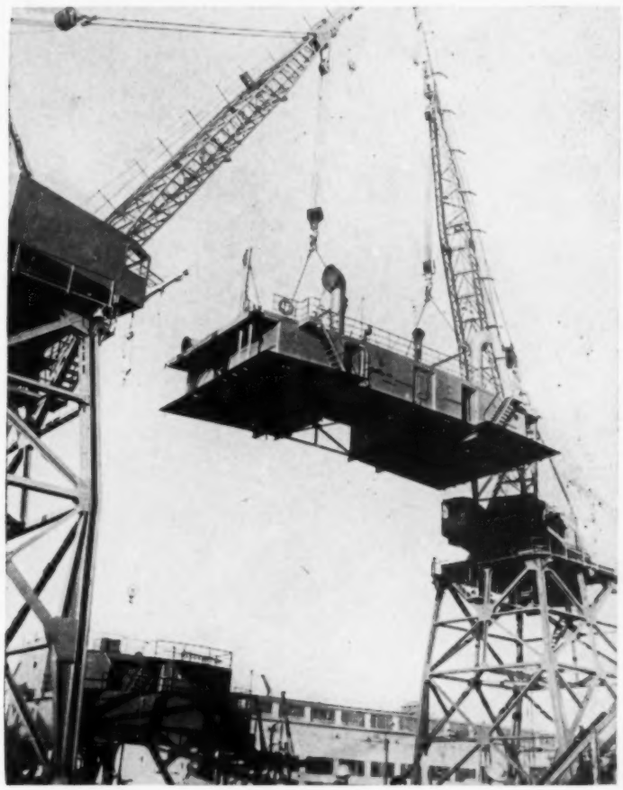
DECK SECTION UNIT is lowered into place on hull by cranes.



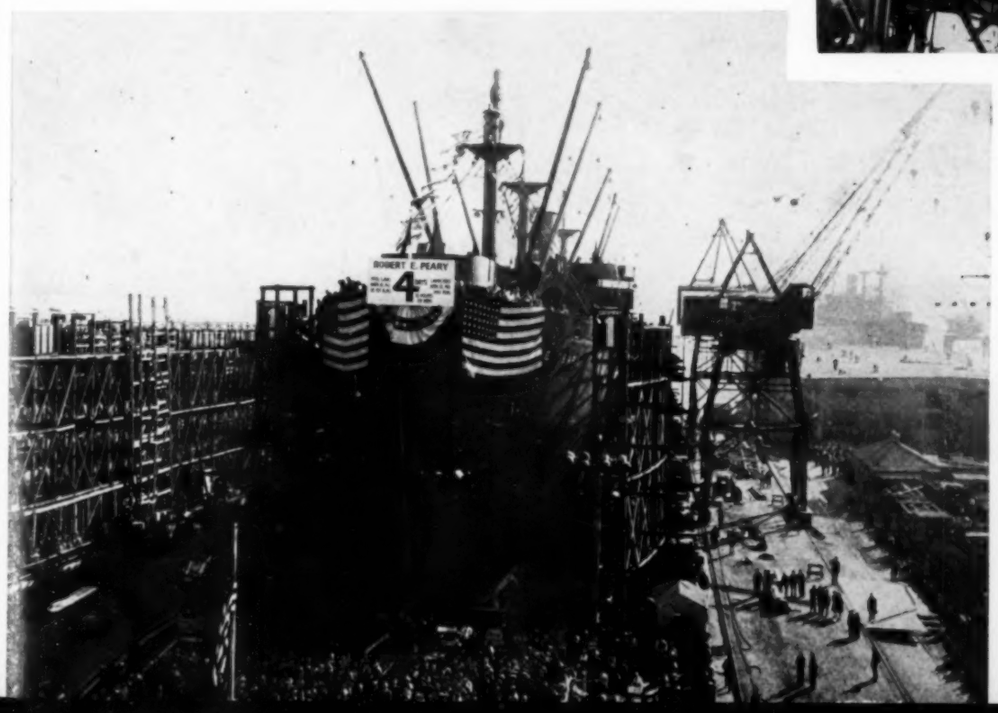
TRANSVERSE BULKHEAD, prefabricated at area adjacent to shipway, is lowered into position.



PREFABRICATED SUPERSTRUCTURE UNIT, weighing 210 tons, has been assembled, complete, on production line and is here lifted bodily by special gantry crane for installation on floating hull.



MAIN DECKHOUSE is prefabricated as complete unit off ways and handled to place by pair of revolving cranes atop traveling gantries.



U.S. Maritime Commission Photos

WORLD RECORD for speedy construction of Liberty ship was established by "Robert E. Peary" (left), here shown just prior to launching at Richmond Shipyard No. 2 in California. Elapsed time from keel laying to launching was 4 days, 15 hr., 29 min.

YESTERDAY—2-cycle Diesels helped rush through huge ordnance projects . . . shown here on one of the biggest!

Veterans . . .

They're at it again! They put in thousands of tough hours on the huge, home front construction program of the past several years . . . now the same 2-cycle Diesel tractors are handling even tougher going on overseas work for our Armed Forces.

Completely overhauled and repaired — much of it done by Allis-Chalmers dealers — there's plenty of service left in these fast-moving, powerful tractors. Today they are doing their part building advanced bases and helping reconstruct devastated areas.

2-cycle Diesel tractors are built to last . . . to perform faithfully for years with less attention. Moreover, they go right to work . . . ***start instantly*** — no wait-

back in Action!

ing around for the engine to warm up. Lubricating truck wheels only once every 200 hours saves on greasing time, too!

The records that 2-cycle Diesel tractors have made and are making on giant defense projects and on the war fronts are your assurance they will stand up to any peace-time job—no matter how tough. Figure on them for your Postwar construction.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

FROM LOGS planks for building construction are produced by two-man hand saw.

Rebuilding in China

Replaces Jap-Bombed Areas With Both Modern And Primitive Structures

CNS Photos

Paul Guillumette, Inc.

SCARCITY OF NAILS in China necessitates use of mortised timber joints chiseled out by native.

EVERYWHERE IN KUNMING, CHINA, new buildings are being put up, but nowhere can one hear the sound of a compressed air drill or a riveting gun or even a hammer hitting a nail, according to the Chinese News Service, official government agency. Nails are too expensive in China for ordinary building construction and as for compressed air tools, there aren't any. The only nails available are rusty nails salvaged from buildings destroyed by Japanese bombs and these are sold a few at a time at high prices. They are used only when one cannot employ a substitute.

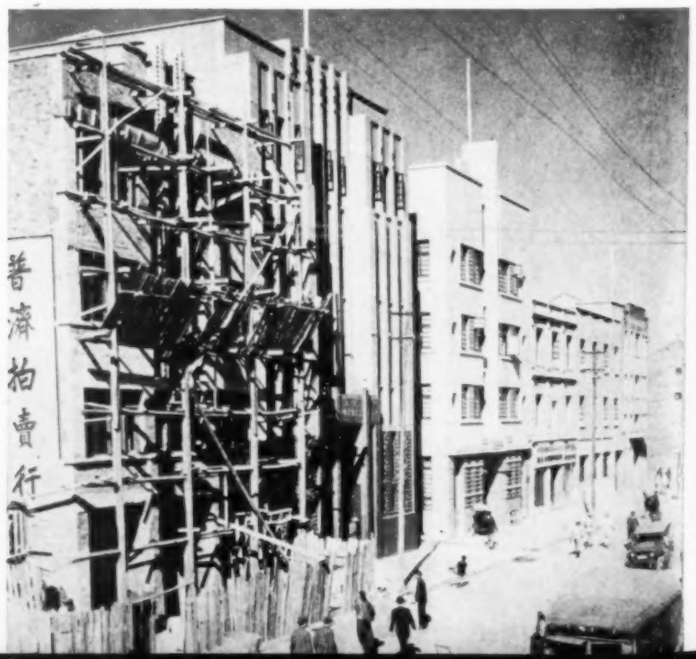
Despite the lack of nails, houses and business buildings of both modern and primitive types go up to replace those destroyed by the Japanese and to house the growing population of western China. They are houses of wood, mud and bamboo—mostly mud and bamboo. Many have thatched roofs and some have roofs of cheap tile. Few have heat of any kind. Still fewer have running water. Hundreds of thousands of people, including many government officials, are living under conditions similar to those of a boom mining town in the early days of the American West.

There are better houses and worse houses. But here is the story of an average house put up by an average man of the upper middle class in Kunming. Mr. So And So calls in a contractor and asks for a design and an estimate of expenses. The contractor tells him that every 10 sq. ft. that he incloses will cost approximately $10,000 in Chinese currency. Details agreed upon, the contractor erects several rough wooden posts, picking especially strong ones for the corners of the house. Light pieces of wood or strips of bamboo are tied together with bamboo thongs, used in place of nails, to divide the spaces between the posts into squares. Then bamboo poles are split into long

(*Continued on page* 132)

ONE OF TALLEST BUILDINGS of modern design in Kunming is six-story Kunming Bank structure (below), complete except for elevator.

BRICK STRUCTURE (below) rises on site of bombed building on Nan Ping St. in Kunming. Scaffolding is erected without use of nails.



Four Truck-Cranes

Work as Team to Place 20-Ton 200-Ft. Timber Trusses

FOUR TRUCK-CRANES performed effective teamwork in hoisting to place on walls 35 ft. high 20-ton timber bowstring trusses of 200-ft. span for a new 200x570-ft. building at the plant of the Ryan Aeronautical Co., San Diego, Calif. The trusses, assembled flat on the ground from parts accurately cut to template, are 25 ft. high and are spaced 19 ft. apart. Their upper chords are laminated, using six 3x12-in. members, while the lower chords are solid 12x14-in. timbers joined with steel splice plates. Vertical tension members are 1⅛-in. steel rods. Diagonals, in compression, are 8x12's. The long-span trusses were adopted in the building design to meet a need for a wide floor space unobstructed by columns which would interfere with aircraft assembly operations.

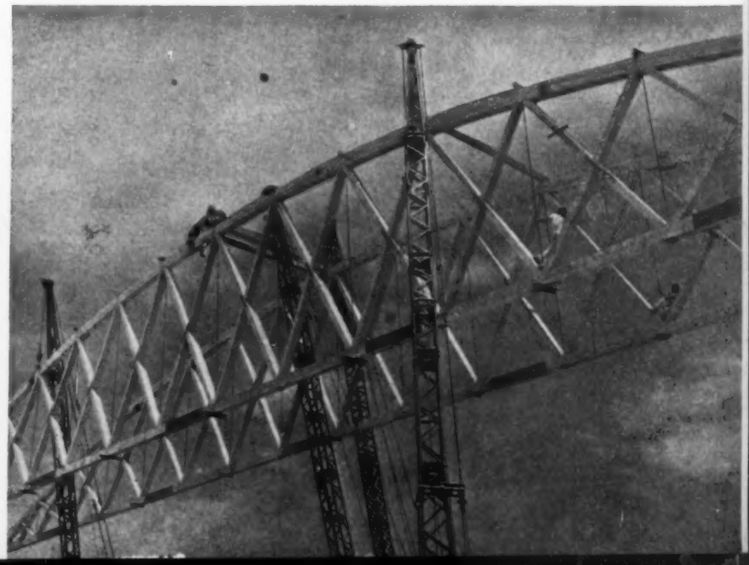
The main problem in lifting the trusses was not one of actual weight, but rather of avoiding excessive distortion or overloading of individual members. Four Lorain truck-cranes were operated in unison for the hoisting operations until a sufficient number of trusses were in place and tied together by the horizontal and vertical bracing systems to insure lateral support for succeeding units. After this stage

(*Continued on page* 114)

200-FT., 20-TON TRUSS is lifted into place on 35-ft. wall by four Lorain truck-cranes working as team to avoid excessive distortion or overloading of individual members. As soon as enough trusses are tied together by horizontal and vertical bracing system to provide lateral support, erection of remaining trusses is handled by three cranes. Reversal of stresses incident to hoisting is provided for in design.

ASSEMBLED ON GROUND, bowstring trusses (below) are up-ended, ready for lifting into place. Upper chords are laminated, using six 3x12-in. members, permitting use of small sizes of timber and simplifying formation of curve. Lower chords are solid 12x14-in. timbers joined with steel splice plates.

CLOSE COOPERATION among crane operators (below) is necessary to maintain equal distribution of loads while maneuvering truss into position.



CIVIL ENGINEERS SPUR *Post-War Projects*

EXECUTIVE DIRECTOR of research and development division, established March 31 by Committee on Post-War Construction, American Society of Civil Engineers, is VINCENT B. SMITH, associate editor, "Construction Methods."

RESOLUTION

American Society of Civil Engineers

Committee on Post-War Contruction

WHEREAS, the McGraw-Hill Publishing Company and the managements of "Construction Methods" and "Engineering News-Record" have offered to the Committee on Post-War Construction of the American Society of Civil Engineers the services of one of their principal editors, Mr. Vincent B. Smith, and the services of their statistical organization and technical publications for the more intensive promotion of the objectives of the Committee on Post-War Construction, with respect to aggressively stimulating the immediate preparation of plans and specifications for post-war construction.

BE IT RESOLVED: That the Committee on Post-War Constuction of the American Society of Civil Engineers hereby expresses its sincere appreciation to the McGraw-Hill Publishing Company and to the managements of "Construction Methods" and "Engineering News-Record" for this generous contribution of their services and cooperation.

AS DIRECTOR for research and development activity, Committee on Post-War Construction, Am. Soc. C. E., appoints MARK B. OWEN, whose background includes experience as municipal official and as manager of engineering sales.

TO STIMULATE AND ASSIST local private interests and government units in expediting completion of engineering and architectural plans looking toward post-war employment in the construction industry, the Committee on Post-War Construction of the American Society of Civil Engineers on March 31 created a Research and Development Division and appointed Vincent B. Smith, associate editor, *Construction Methods*, to serve as executive director of the new activity. The committee further recommended the appointment of Mark B. Owen, of Hastings-on-Hudson, N. Y., as director.

Establishment of the research and development activity is the outgrowth of nine months' intensive work by the civil engineers' post-war construction committee. Operations of the division are directed from a central office at 330 W. 42 St., New York. The research staff is to use the reporting facilities of an established organization of 100 trained *Engineering News-Record* field correspondents under the direction of Elsie Eaves, who will supply project reports on preplanning for post-war construction.

Reports will be furnished to newspapers and to technical and business publications interested in such data, as well as to public and civic organizations and to the local sections of the American Society of Civil Engineers.

The program is to be correlated with the post-war planning work of local units of the Committee for Economic Development, chambers of commerce, labor organizations and similar groups interested in post-war economic and construction planning on a national and local basis.

By a special arrangement with the McGraw-Hill Publishing Co., the committee has had placed at its disposal the services of Mr. Smith and the field reporting facilities of *Engineering News-Record*. Mr. Smith, who has been on the editorial staff of *Construction Methods* for 17 years, is also to act as post-war construction consultant for both papers.

Mr. Owen's experience includes eight years as commissioner of public works and engineering for the city of Dearborn, Mich., followed by seven years as manager of engineering sales for a manufacturer. He is a past-president of the American Public Works Association.

COMMITTEE ON POST-WAR CONSTRUCTION, American Society of Civil Engineers, at meeting in Washington March 31 creates research and development division to stimulate advance preparation of complete plans and clearance of all obstacles for timed letting of contracts on post-war construction projects after end of hostilities. Left to right, seated: DEAN G. EDWARDS, New York; MALCOLM PIRNIE, New York, ex officio, president of society; G. DONALD KENNEDY, Washington, D. C., committee chairman; standing: GUSTAV J. REQUARDT, Baltimore; CHARLES T. LEEDS, Los Angeles; A. J. ACKERMAN, Pittsburgh; HAL HALE, Washington; and E. LAWRENCE CHANDLER, assistant to the secretary and Washington representative, Am. Soc. C. E. Committee members missing from picture are FREDERICK H. FOWLER, San Francisco, and FRANK T. SHEETS, Chicago.

Ground Crew

Next time you see a bomber overhead—stop and think for a minute of what it took to put it up there.

Think of the aluminum that sheathes its sleek lines . . . aluminum from a plant that was only a blueprint yesterday. Think of the propellers and the engines that drive it . . . propellers and engines from factories that were only corn fields the summer before. And think of the men who fly it and fight it . . . men schooled at air fields and training stations which were created virtually overnight.

All of these facilities and more were required to put that bomber up there . . . and all of them were provided by a vast ground crew that numbers its men and machines in the millions—America's Construction Industry.

Here, again, is a job that called for the best in every man and every piece of equipment . . . a job that required power of proven stamina, economy and dependability . . . a job that demanded nothing less than *Cummins Diesel Power*. CUMMINS ENGINE COMPANY, Columbus, Indiana.

This is the sixth and last in a series of advertisements depicting the war-time role of Cummins Diesel Power in the nation's basic industries. In the construction field, Cummins Dependable Diesels are used to power all types of heavy-duty dirt moving and material handling machinery—trucks, shovels, draglines, tractors, compressors and many other kinds of equipment. The giant 60-yard Tournapull illustrated here is powered by a pair of 200 hp. (Supercharged) Cummins Diesels.

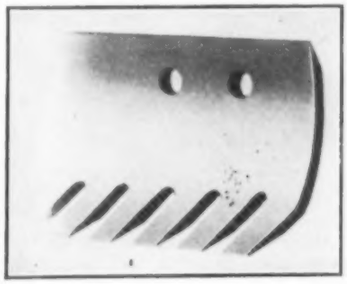
SHUNK

GRADER BLADES

★

Uniform Quality Give Longer Life

★



These are specific advantages that come from definite design and construction features. The blades are made from special refined high carbon, high manganese plow steel—

They are rolled to our analysis in our rolls at the mill—

Forged at the edges and ends to add strength and fineness to the steel. Prompt shipment assured from an ample stock of various types and sizes. When ordering give name, model number, length and thickness, also total number of holes in blade.

As the Post-War plans for new construction and rebuilding of city streets, highways, airports and similar public works projects gain momentum there will be an increasing need for modern equipment. SHUNK will be ready not only with Grader Blades but a full line of equipment to meet the demands for speedy low cost post-war construction.

Consult SHUNK on your present needs for all type Grader and Scraper Blades and Saw Tooth Scarifier Blades and for economical earth moving equipment for Post-War construction.

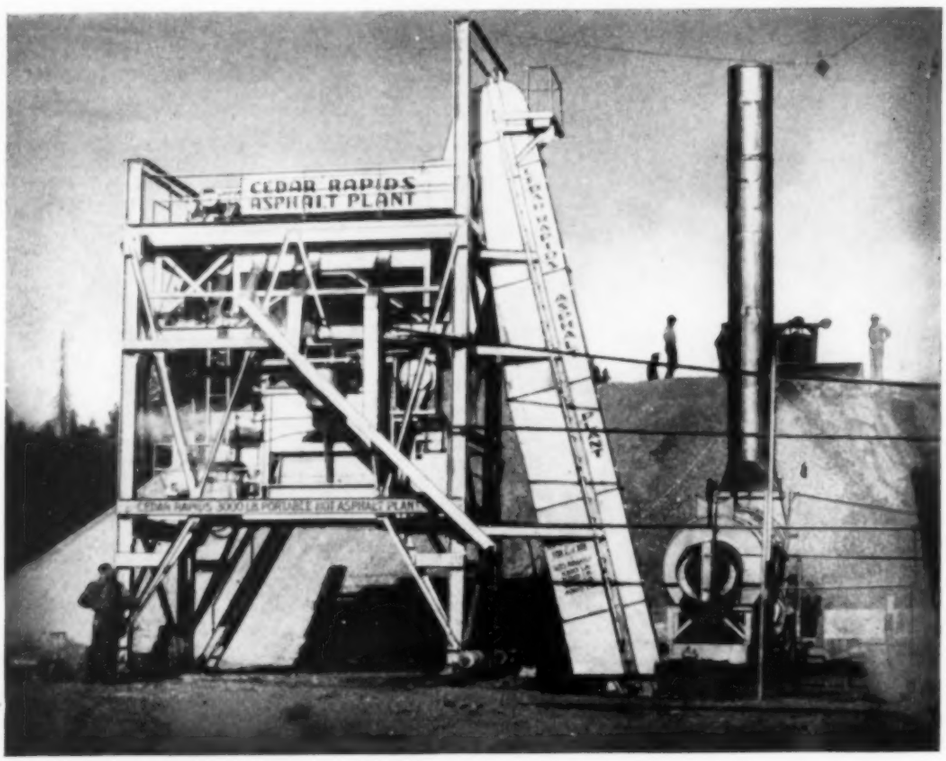
Shunk Mfg. Company

Established in 1854

BUCYRUS · OHIO

CONSTRUCTION EQUIPMENT NEWS

APRIL, 1944 REVIEW of Construction Machinery and Materials



ASPHALT MIXING PLANT features easy portability by truck and swift erection and knockdown. Has capacity of 3,000 or 4,000 lb. of hot or cold bituminous mix per batch. Starting with aggregate drying unit, which is mounted on wheels with pneumatic tires, aggregate is carried by hot material elevator, inclosed in dustproof housing, to double-deck horizontal vibrating screen. Graded aggregate falls into three-compartment storage hopper with capacity of six batches. Hopper and sizing screen are totally inclosed in steel dustproof housing. From hopper, proper proportions of material are dumped into aggregate batcher, which is mounted on dial indicating, springless scales. Steam-jacketed asphalt batcher also is mounted on scales. Batchers empty material into 3,000-or 4,000-lb. twin-shaft, steam-jacketed, all-steel pugmill. Electric, gasoline, or diesel power can be used. Controls for all operations, including bin-gate levers, pugmill discharge lever, and motor push-button switches, are centrally located on operator's platform.—**Iowa Mfg. Co., Cedar Rapids, Iowa.**

★ ★ ★

OIL AND GREASE ON HANDS AND ARMS are said to be satisfactorily removed by "Flix", hand-sized, semi-quilted pad containing remarkably effective absorbent substance which leaves skin clean and dry. Advantages claimed: helps prevent skin diseases; economical; safe (will not burn and has no loose ends to catch in machinery) and sanitary. Also useful in removing oil from machine parts preparatory to painting. Speeds clean-ups after working hours and conserves soap.—**Waverly Petroleum Products Co., Philadelphia, Pa.**

ADAMS MOTOR GRADERS

Pack Plenty of Power

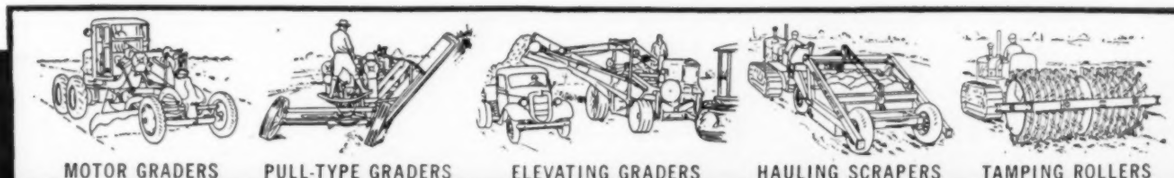
One of a series of ads on Adams motor grader features

TURNING a capacity load of heavy oil-mix material at 3 to 5 m.p.h. (as pictured above) takes plenty of power . . . and traction . . . but Adams heavy-duty motor graders have what it takes. All models of Adams motor graders pack plenty of power for their size enabling you to get out of any model the capacity built into it. When you get into an extraordinary load the engine has the torque reserve or lugging ability to hang on where some engines would stall. The operator never experiences the feeling that his machine is under-powered . . . Incidentally the Diesel engines used in Adams motor graders are started easily in any kind of weather and are very economical to operate and maintain.

Yes . . . their abundance of power, their long life, ease and economy of operation, their wide adaptability to all kinds of work . . . surface, ditch and bank . . . make Adams motor graders favorites among the several thousands of highway officials and contractors who own and know them. They will be your best buy when again you can purchase new machines. In the meantime, use the services of your local Adams dealer to keep your present equipment rolling.

J. D. ADAMS COMPANY · INDIANAPOLIS, IND.

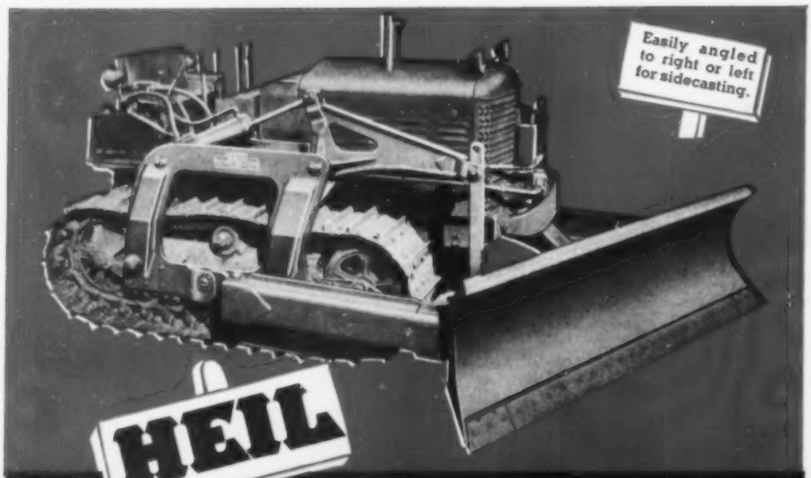
Granted a second Army-Navy Production Award for continued proficiency in the production of grading machinery for our armed forces



MOTOR GRADERS · PULL-TYPE GRADERS · ELEVATING GRADERS · HAULING SCRAPERS · TAMPING ROLLERS

ADAMS

☆ ROAD-BUILDING AND ☆
EARTH-MOVING EQUIPMENT



Hydraulic Bulldozers and Trailbuilders

..for bigger loads and more yardage ..per day..per year

You get bonus loads with Heil dependable 4-wheel Scrapers . . .

Heil design gives you all-welded construction, fulcrum-type lift, ample tire clearance, more efficient performance under widely varying field conditions—feature after feature that will help establish your reputation as a successful operator.

Enjoy the benefits of easier maintenance, longer life, and simpler field repairs when working far from a supply base.

Write for bulletins giving details of Heil's advanced design.

SEE YOUR CLETRAC TRACTOR DISTRIBUTOR

The advanced design of Heil Bulldozers and Trailbuilders assures you of more speed, greater flexibility, and ability to take the tough jobs without wavering.

Heil's experienced fabricators have replaced many of the heavier members with welded box sections that are lighter, stronger, and easier to repair in the field without costly delays.

This equipment is tailormade to Cletrac Tractors, giving you full visibility for safe, efficient handling. The Heil hydraulic system comes close to a perfect leak-proof unit — stays in adjustment and gives you a minimum of trouble.

Achieve a reputation for "on-time" performance with Heil Earth-moving equipment.

Write for bulletins.

R-26

ARMY NAVY

THE HEIL CO.

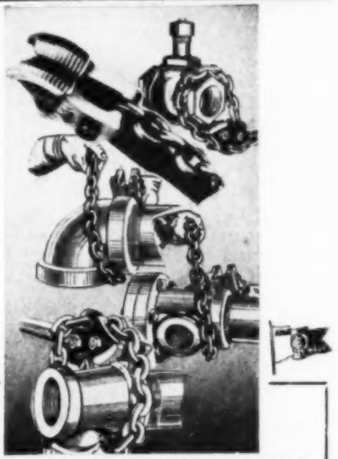
GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

PAINT STICK MARKER for making distinct, lasting imprints on wet, sleek, oily metal surfaces and designated Markal "B", has been developed for use in shipyards and other outdoor locations. Eliminates need of paint and brush in layout departments,

fabricating shops, yards, hull departments and other places where weather-proof, fade-proof and permanent markings are necessary to avoid delay and confusion. Has all properties of liquid paint, yet is handy, clean and provides extra mileage. Made in variety of colors for easy identification purposes as well as for piece work marking.—**Markal Co., 6 E. Lake St., Chicago, Ill.**

Look for the Arm-and-Hammer

ARMSTRONG BROS.



IDEAL CHAIN TONGS

For Pipe, Fittings and Flanges

The JAWS have straight teeth for pipe, and V shaped teeth for fittings. Drop-forged from special high carbon steel carefully milled, heat-treated and hardened for toughness and lasting qualities.

The HANDLES are forged from spring steel heat-treated to give the required stiffness.

The CHAINS are proof-tested.

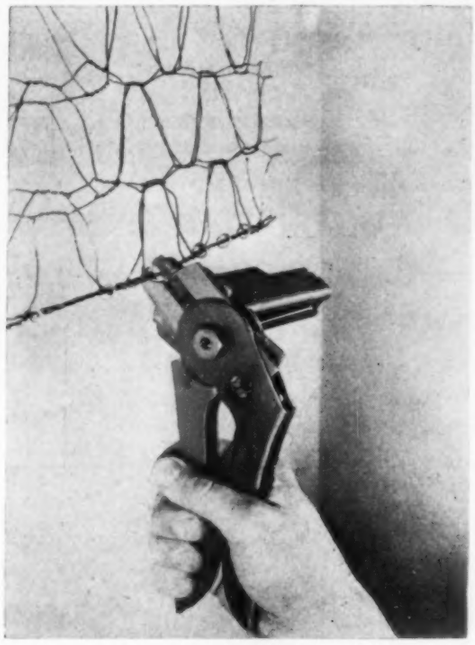
Write for catalog C-39a for complete showing and description of Armstrong Pipe Tools.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
334 N. FRANCISCO AVE. CHICAGO, U.S.A.
Eastern Warehouse & Sales, 199 Lafayette St., New York

WATERPROOFING LIQUID, slightly heavier than water, may be painted or sprayed on almost any surface, such as brick, concrete, stone, wood, linoleum or metal to form a flexible film less than two-thousandths of an inch in thickness and with a tensile strength of more than 100 lb. per sq. in. Responds to expansion and contraction of base material and does not crack. Neither heat nor cold affects its efficiency, according to manufacturers. Single coat dries in 2 hr. May be applied over paint or surface may be waterproofed by Seallock and painted afterwards. Uses: (1) With cheesecloth or any other suitable fabric, liquid provides satisfactory membrane waterproofing unit; (2) Cellar walls, when brushed or sprayed, provided they are dry, become thoroughly waterproof; (3) Seallock will fill ordinary crack in cement or other composition, sealing it against water. While Seallock is somewhat inflammable, it ceases to be so after application.—**The Seallock Co., White Plains, N. Y.**

★ ★ ★

STAPLING PLIER, magazine fed, wraps staple around work, applying 60 to 70 rings with one loading. Narrow jaws enable it to get into small spaces. Rapid one-hand operation. Weight less



than 2 lb. Ring diameter, ¼ in. Ring overlap, ¼ in. Wire size No. 16. Developed for armed forces for attaching strips of wire netting and fence wires, Bostitch plier is now available in limited number to civilian industries—**"Bostitch", 117 Division St., East Greenwich, R. I.**

★ ★ ★

COATED ALUMINUM BRONZE ELECTRODE (No. 100) of coated, high tensile, shielded-arc type, may be used as filler rod in carbon arc welding and is claimed to produce welding deposits of great strength and hot ductility, combined with desirable resistance to corrosion. Has universal application in welding of most bronzes, malleable and cast iron or steel. May also be used for welding dissimilar metals, such as cast iron to brass, steel to malleable iron, or for joining of any two metals which are weldable with aluminum-bronze. Sizes from ⅛ in. to $\frac{3}{16}$ in. in 14-in. lengths and ¼ in. in 18-in. lengths. Sizes from $\frac{5}{32}$ to ½ in. in 18-in. lengths may be obtained on order.—**Air Reduction Sales Co., 60 E. 42nd St., New York City.**

A simple adjustment changes over from extreme height for throwing to unlimited "down" thrust for deep penetration.

Blade raised to extreme height for "throwing."

HEIL

Cable Dozers

. . . easily adjusted for an extra deep bite . . . to move more dirt—faster

The Heil Cable Dozer digs at maximum depth, whether in soft dirt or in hard-packed clay — because Heil engineers have designed this rugged unit to penetrate into the ground up to the tractor's ability to push dirt. Simply place the side arms in the upper hole in the frame, and you can achieve super-penetration.

Heil Cable Dozers are engineered to work with International Harvester TracTracTors as a perfectly balanced team. The simplified mounting avoids obstructing operator's view—gives him full vision ahead. Here is a machine that performs smoothly . . . gives fast, positive action under the toughest conditions, with minimum maintenance.

Trailbuilder blade and "A" frame are interchangeable with the Bulldozer blade and frame.

Write for Bulletins.

R-25

SEE YOUR INTERNATIONAL TRACTRACTOR DEALER

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

LUFKIN

"WOLVERINE"
CHROME CLAD
STEEL TAPE

The Lufkin Chrome Clad "Wolverine" Steel Tape is a favorite with engineers. Its durable markings — jet black against a satin chrome surface are extremely easy to read. The strong, sturdy line effectively resists rust, is easily kept clean. The metal disk reel is light-weight and rust proof. The Tape Ring locks under a spring on the reel, guarding against first end breakage. The one piece winding handle gives extra leverage and when turned over locks the tape at any point.

Write for free catalog.

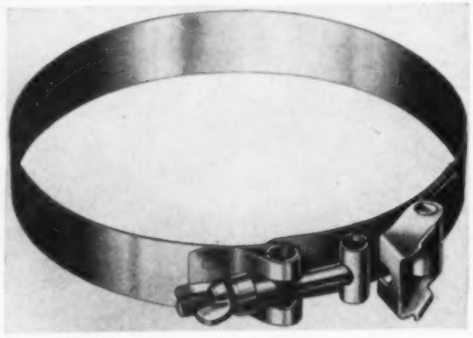
BUY THROUGH YOUR DISTRIBUTOR

LUFKIN

SAGINAW, MICHIGAN • New York City

TAPES · RULES · PRECISION TOOLS

NEW TYPE CLAMP for handling removable equipment, such as oxygen containers, fire extinguishers and duct sections combines snap-on latch with full adjustment of standard clamp, all in one unit, permitting instantaneous removal of clamp or its quick installation. "Quick-Coupler" is available in



all sizes, in aluminum alloy and stainless steel and in shapes to fit all convex surfaces; also with self-locking, plain hex or wing nuts. Like all Marman clamps, design of this device permits application of uniform radial pressure to periphery of parts over which it is installed and its rugged construction allows re-use without loss of efficiency. —**Marman Products Co., Inc., Inglewood, Calif.**

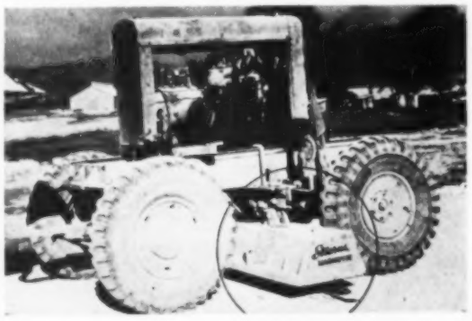
★ ★ ★

STRAP WRENCH has been designed to insure better handling and protection of polished nickel and chrome pipe and tubing. Made all in one piece with I-beam handle and solid head and with

hang-up hole in end. Easy to attach and use. Positive in grip. Special webbing strap quickly removed for replacement by pushing out pin held by spring clips. Made in two sizes: No. 2, capacity ⅛ to 2 in., 17-in. strap; No. 5, 1 to 5 in., 30-in. strap.—**The Ridge Tool Co., Elyria, Ohio**

★ ★ ★

RECTANGULAR ROAD SWEEPING MAGNET, available in 18-in. standard width and in 60-, 72-, 84- and 96-in. lengths, depending upon width of sweep desired, is equipped with suspension



lugs that are adaptable to all types of vehicles. Especially useful in keeping roads in shape for automobiles, trucks and buses and thus conserving tires.—**Stearns Magnetic Mfg. Co., 635 S. 28th St., Milwaukee, Wis.**

Sonotube

MATERIALLY
CUTS LUMBER
COSTS —

Laminated Fibre

Concrete Pier Forms

6 Standard Sizes

INSIDE DIAMETER					
8"	9"	10"	11¼"	12"	13½"
SQUARE INCHES					
50.26	64	78.54	100	113.1	144

Smaller sizes available.

IMMEDIATE DELIVERY

Contrast the above form and minimum bracing required with conventional wooden form constructed by hand on job.

A CRITICAL NEED
SAVE
WASTE
PAPER

ARMY NAVY

SONOCO PRODUCTS COMPANY

HARTSVILLE, S. C. MYSTIC, CONN.
ROCKINGHAM, N. C. GARWOOD, N. J. LOWELL, MASS.

Official U. S. Army Signal Corps Photograph

LANDING FORCE abroad needs full machine support at home. To keep *CONSTRUCTION* equipment meeting today's stepped-up programs use . . .

. . . SINCLAIR SPECIALIZED OILS and GREASES. These lubricants help keep all types of equipment standing up under the hard grind of continuous operation and heaviest loads.

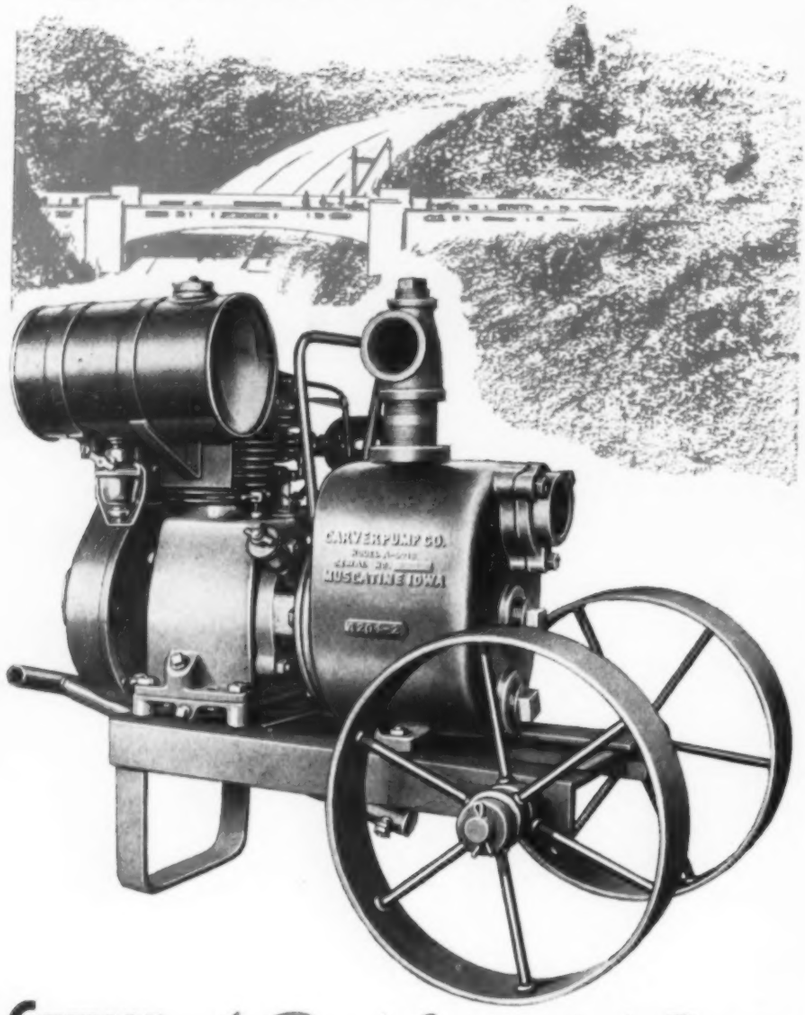
(Write for "The Service Factor"—published periodically and devoted to the solution of lubricating problems.)

SINCLAIR LUBRICANTS-FUELS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY (INC.), 630 FIFTH AVENUE, NEW YORK 20, N. Y.

in the foreground of tomorrow's

Construction Picture...



Carver...*the Road Contractor's Pump*

★ A poor dewatering pump is a "luxury" you can't afford on tomorrow's closely-bid jobs . . . You'll need a tough, rugged CARVER to handle the sandy, gritty water without clogging or excessive wear. CARVERS have shown savings as high as $20,000 in dewatering costs on a single job.

When the time for your next job arrives, remember that you can add plenty to your profits with the hours and dollars a CARVER can save. Get the pump which is the new standard on road jobs—see your nearby CARVER distributor, or write us for a copy of the CARVER catalog NOW.

THE CARVER PUMP CO.
Muscatine, Iowa

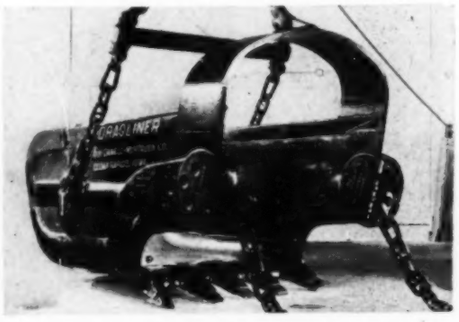
CARVER CENTRIFUGAL Certified PUMPS

CENTER-HOLE HYDRAULIC PULLER, available in five models of 30- to 100-tons capacity, is a valuable tool for use in pulling in utility service pipe, bushings, cylinder liners, cutless bearings, pistons, wrist pins, valve seats, keys, wheels, sprockets, gears, boiler tubes and pipes. It is also used to pull together structural members and for welding and riveting. Simplex Jenny pulls, pushes or lifts

and can be rigged up as a portable press. Operates vertically or horizontally without need for heavy auxiliary equipment and without side thrust or friction. Is its own back-up and is self-supporting because of its center hole construction. Three models have single pumps and two have high and low speed pumps which may be operated separately, alternately or together. Alloy steel rods are recommended as Jenny will stretch, collapse or pull apart any mild steel rod that will fit in center hole. Unit is built of heat-treated alloy steels to withstand heavy loads and service abuse.—**Templeton, Kenly & Co., 1020 S. Central St., Chicago, Ill.**

★ ★ ★

DRAGLINE BUCKET features combination bumpers and drag-chain hitches which take shock of empty unit when dropped, thus protecting arch and also shield drag hitches so that bucket does not fall on them, resulting in longer service life for hitches. Weight distributed to permit low hitch,

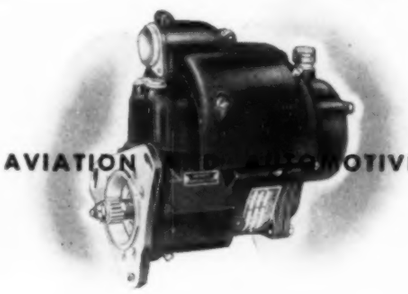


allowing bucket to take hold in tight material without standing on its nose. Replaceable manganese steel lips gives support at its base to arch, ends of which fit into recesses in lip casting. Bumpers tie lip, arch and body together. Lips with either four or five teeth available and teeth are one- or two-piece, as desired. Both types keyed to lip in customary manner.—**Universal Engineering Corp., Cedar Rapids, Iowa.**

"SO THAT'S THE NORTH POLE!"

Soon the North Pole will need a marker — adequate identification for the post-war passengers on polar routes who'll want to tell their friends they've really seen it. Meanwhile American Bosch sticks to its war jobs — starting vibrators for positive ignition at all temperatures from equator to the arctic circle — aviation magnetos that have helped modern aircraft engines maintain service ceilings of seven miles and more — gasoline injection equipment that saves fuel, steps up pay load, increases engine performance and round trip military range. Whether the future will demand more and more production for military needs or a rapid changeover to transports for polar and other global routes, in research, design and production, American Bosch will continue to serve all branches of the internal combustion industry.

AMERICAN BOSCH CORPORATION • SPRINGFIELD, MASSACHUSETTS



AMERICAN BOSCH

AVIATION AND AUTOMOTIVE ELECTRICAL PRODUCTS • FUEL INJECTION EQUIPMENT

When fewer men must do a bigger job...

Any measure that saves man-hours becomes increasingly important when costs are the governing factor.

Every time a worker leaves his job for a drink of water, precious moments are wasted; every time he is a sick-absentee whole days are lost.

A Quicker, Safer Method...

The use of Dixie Portable Water Carriers has solved the problem on many a wartime construction project. Men are served in minimum time right where they work ... and each drinks from a clean, individual Dixie or Vortex Cup.

They help to check contagion at the contamination point...avoid the possible spread of disease from mouth-to-mouth contact. And workers are far better satisfied with this modern watering method.

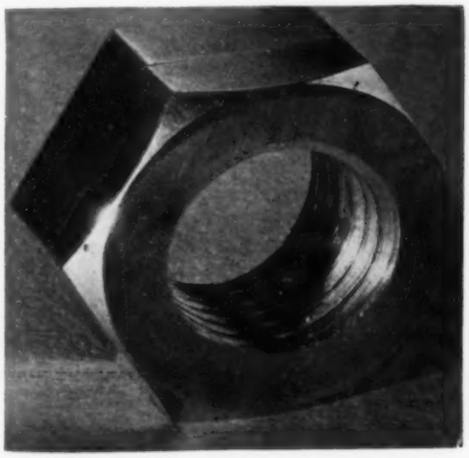
Write for descriptive folder giving complete information on this portable water service, including tanks, dispensers and cups.

Dixie and Vortex Cups are made at Easton, Pa. Chicago, Ill., Darlington, S. C. and Toronto, Canada.

DIXIE CUPS

DRINKING CUPS AND FOOD CONTAINERS

VIBRATION RESISTANT NUT utilizes elasticity of steel in wall to provide gripping action on threads of bolt by compressing top of nut against taper-threaded, hardened steel mandrel, making threaded section of nut elliptical at top and leaving bottom round. When nut is applied, it can be screwed on about half way by hand, but from there on wrench nut is used. Nuts are similar to common nuts in appearance and have tolerances as prescribed in Class 3 fit. Gripping action keeps nut from loosening under vibration, regardless of whether or not it bears on work. No washers or other parts needed. Nut can be re-used without

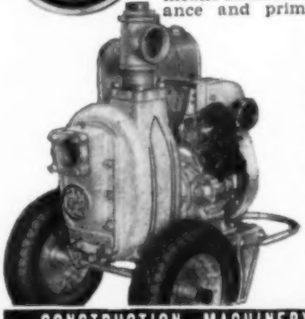


substantially reducing gripping action or damaging threads. Available in both U. S. Standard and S.A.E. thread from ¼ in. to 1½ in. bolt size in mild steel, alloy steel, brass and plated finishes.— **Stover Lock Nut & Machinery Corp., Bushkill Dr., Easton, Pa.**

They Can Take It

DUAL PRIMERS

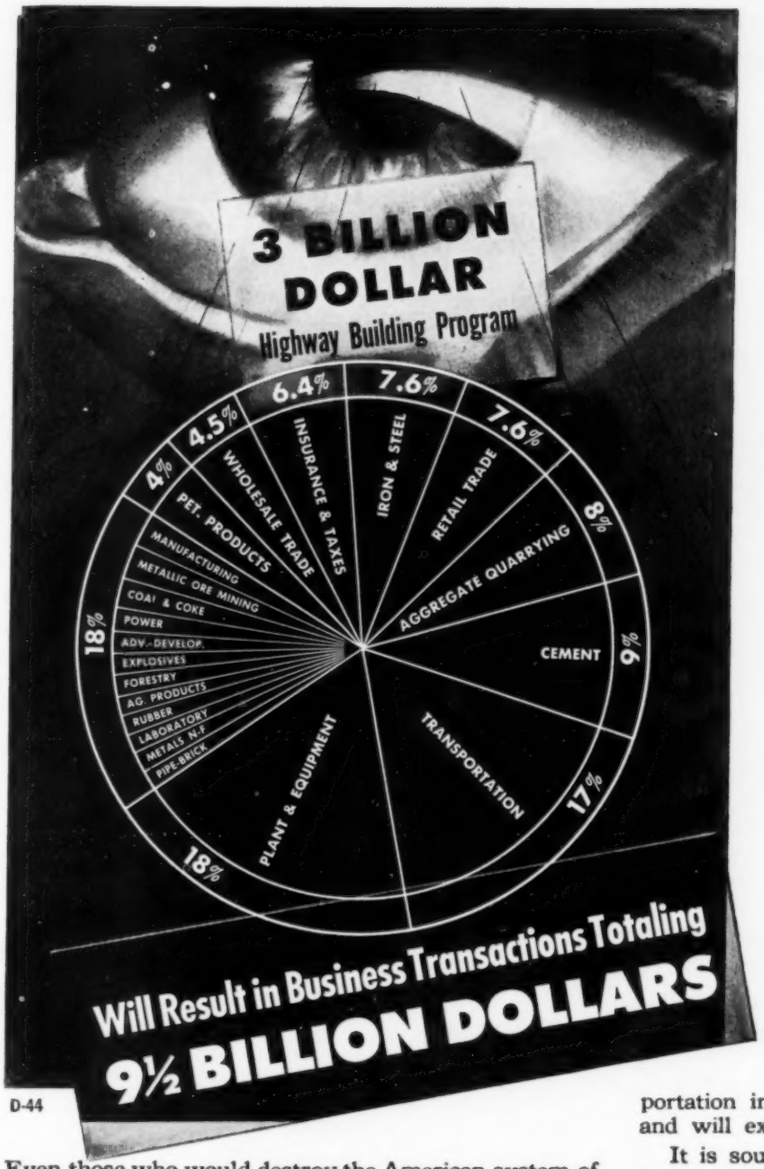
When it comes to DURABILITY, CMC Dual Primers have the "guts" to stand up to those tough, steady 24-hour grinds. DUAL PRIME means unmatched performance and priming speed.



A husky 3" CMC Dual Prime. One of the complete line from 1½" to 10" sizes. Also 3" and 4" Diaphragms. Get catalog.

CONSTRUCTION MACHINERY CO.
Waterloo, Iowa

Mixers • Pumps • Hoists • Batching & Placing Equipment • Saws • Carts • Barrows



D-44

$s × $s = Worthwhile Jobs

Giant Stride to Keep Free Enterprise FREE

PROPOSED BY AMERICAN ROAD BUILDERS' ASSOCIATION

Even those who would destroy the American system of free enterprise must credit it with the greatest war production record the world has ever known.

But, that is not enough to keep free enterprise free. No segment of industry can afford to relax when the pressure of war is off. Nothing short of full employment will make freedom of enterprise secure through many difficult post-war years.

Because it is a basic and a giant stride toward this "must" goal, we urge all industry to get behind and push forward the planned peacetime program of the American Road Builders' Association.

It is sound because its proposed 3 billion dollar annual investment in highways multiplies to eventually result in business transactions totaling 9½ billion. (See chart above based on studies by U. S. Public Roads Administration.)

It is sound because it is capable of directly employing 3 million persons quickly and of contributing indirectly to the supporting of many more million jobs. (The highway transportation industry alone normally employs 7,000,000 and will expand with highway construction.)

It is sound because the economic structure of the country is built around the motor vehicle and will become more dependent upon it. Gasoline rationing forcibly brought this fact home.

It is sound because our highway system is inadequate, has suffered from heavy war traffic, weathering and limited maintenance.

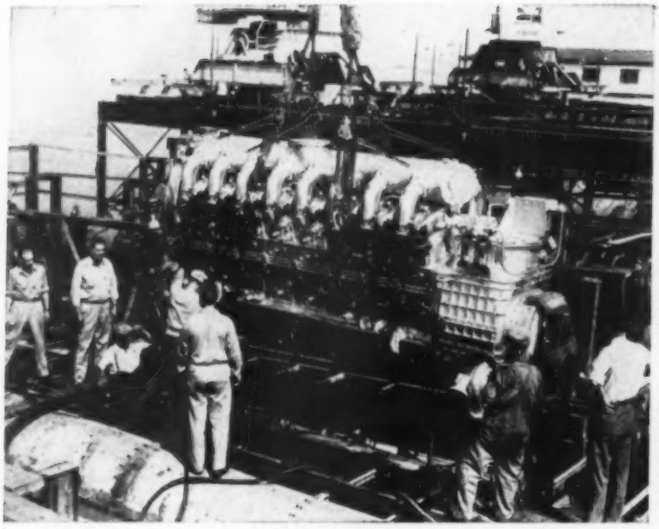
It is sound because registration fees, gasoline taxes, municipal and county taxes, Federal user taxes, personal property taxes and tolls, if all used for highway purposes, would eventually be sufficient to build and maintain the highway system.

It is sound because it provides for competitive bids by contractors of experience. This insures higher efficiency, better construction at lower costs than can be obtained by the force account system of work relief.

The American Road Builders' Association, 1319 F St. N. W., Washington 4, D.C., has made a fourth printing of a 64-page book entitled "A Sound Plan for Postwar Roads and Jobs." We suggest that every American write for it—to the Association direct or to—

union Wire Rope corporation

Tulsa • Houston • Chicago • Salt Lake City • New Orleans **2160 Manchester Ave., KANSAS CITY, MO.** Monahans, Tex. • Portland, Ore. • Ashland, Ky. • Atlanta

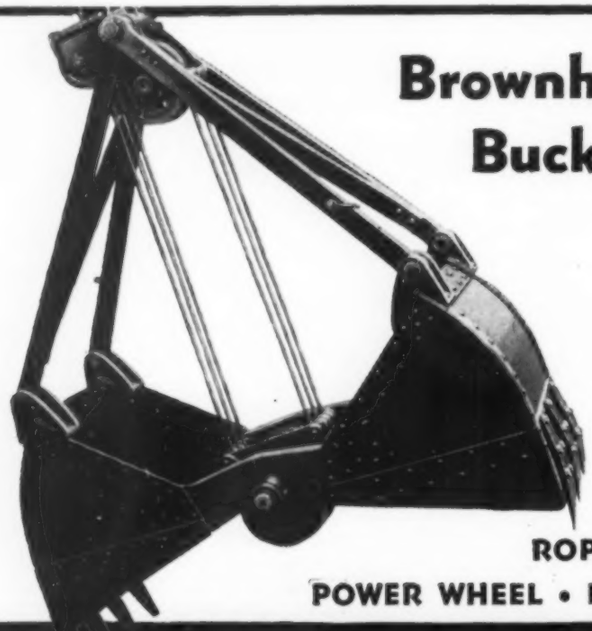


"Safety-Pull" hoists spotting 2,000 horsepower deisel engine

The Same SIMPLE OPERATION in all Sizes of "SAFETY-PULL" RATCHET LEVER HOISTS

Side lever control for positive "up or down." A neutral position for safety control. Reversible handle permits the operating of hoist in any position. Safety stops prevents handle from spinning. Nine models from ¾ to 15 tons. *Write today for catalog DG6.*

COFFING HOIST COMPANY
DANVILLE ILLINOIS



Brownhoist Buckets

ROPE REEVE • POWER WHEEL • LINK TYPE

Handling ore, gravel, coal or dirt Brownhoist Buckets do a better job because: 1) Larger sheaves reduce rope wear, 2) Heavy carbon-steel digging lips take deep clean bites, 3) Extra-sturdy construction insures long-life. Write to Industrial Brownhoist Corporation, Bay City, Michigan. Offices in New York, Philadelphia, Pittsburgh, Cleveland and Chicago.

NEWS FROM MANUFACTURERS

About Their Products

The publications reviewed below, will keep you posted on latest developments in construction equipment and materials available for your use.

WARTIME CARE OF CHAIN BELT DRIVES — **Chain Belt Co.**, Milwaukee, Wis. (20 pp., illustrated) This booklet was produced with the idea of helping users get the most out of their existing drives and save costly delays and unnecessary expense. Subjects discussed: Lubrication of slow, medium, high and extremely high speed drives; correct amount of chain slack; alignment of sprockets and shafts; value of frequent inspection; procedure in cases of emergency; reasons for avoiding underchaining, and proper chain storage. Check chart gives symptoms of various irregularities, possible causes and remedies.

★ ★ ★

HOSE REELS—**Schramm, Inc.**, West Chester, Pa. (2-pp., illustrated) Describes and illustrates hose reels for all types of mountings, such as ends of tanks with convex heads, ends of tanks with concave heads or on pipe lines; for shop use—mounted under work bench or on wall. Lists features of hose reels (1) easy mounting; (2) built-in valves; (3) sturdy construction; (4) self-sealing, no adjustments or packing, no stuffing boxes, no leaks and easy turning at all times. Specification table and price list.

★ ★ ★

LUMBER INDUSTRY FACTS—Statistical Division, National Lumber Manufacturers Association, 1319 19th St., N.W., Washington, D. C. (60 pp. and cover, illustrated) This booklet, the 1943 edition of which has just been released, presents information designed to help toward understanding of the forest industries, determination of sound public policy and provision within forest products industries of dependable sources of business and employment. It contains 78 statistical tables and 23 charts. Contents include: raw-material—the forest, lumber and timber products, lumber production, lumber shipments, lumber consumption and pulpwood, pulp and paper. Chapter on the forestry situation reviews pertinent legislation. Another outlines the objectives, activities, officers, and membership of the National Lumber Manufacturers Association. Although designed for reference use in the lumber industry, it is used as a text and reference in many schools of forestry to which it is furnished free. Single copies will be mailed upon request to the above address.

This is How it GRIPS Like a Bull Dog

The steel rollers are held securely in place by means of a keeper bar at each end, permitting just sufficient travel to bring into full force the gripping action.
HOUSING
GASKET
The extra-wide, resilient gasket is compression-sealed. Comparison of the black outline with the dotted outline shows how the housing forces the gasket lips against the pipe for leak-proof sealing.
HOUSING
The steel rollers grip as they roll; the greater the pressure the tighter the grip. Position at installation shown in black; under extreme pressure in gray.
The Greater The Pressure The Tighter The Grip
The pipe is firmly gripped by the toothed steel rollers, which imbed themselves in the pipe face and in the housing. These rollers operate to give play to normal expansion and contraction, and permit angular deflection. But when desirable limits of pipe line movement are reached, the gripping rollers oppose separation of pipe ends.
INTERCHANGEABLE HOUSING HALVES
EXTRA LONG NUTS
GASKET
TRACKHEAD BOLTS
OVAL COLLAR
G·B MFG. CO.

ROLAGRIP PIPE COUPLINGS

With only three parts to position and two bolts to tighten, Rolagrips afford the simplest, fastest method of joining pipe for leakproof connections. By using plain end pipe, Rolagrips eliminate time-wasting threading, grooving or flanging operations. Since none of the pipe walls need to be cut away, Rolagrips permit the use of light weight pipe in many industrial installations. When Rolagrips are used, both couplings and pipe may be completely salvaged. Despite heavy demands, prompt shipments are being maintained on Rolagrips; also Segweld Fittings and Gruvagrip Couplings, the latter for grooved end pipe.

FREE

NEW CATALOG showing installations in many industrial fields, complete information, engineering data.

GUSTIN-BACON MFG. CO.

KANSAS CITY 7, MO.

NEW YORK PHILADELPHIA CHICAGO TULSA HOUSTON SAN FRANCISCO

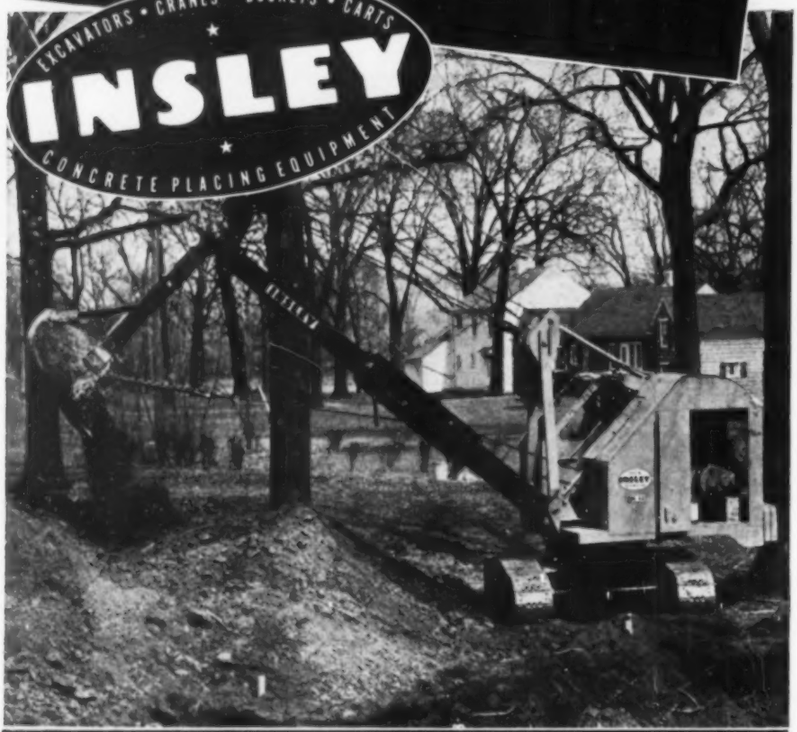
Faster on and off the job

On the fighting front—where time saved may mean lives saved—the Insley Excavator's mobility, speed and ability to work at top efficiency in cramped quarters mean getting to the job and getting it done—*faster!*

Tomorrow—when time will mean the difference between profit and loss on your jobs—you'll find that this same mobility, speed and knack for working in the tight spots will get you on the job and OFF the job—*faster!*

INSLEY MANUFACTURING CORPORATION
INDIANAPOLIS 1, INDIANA.

EXCAVATORS • CRANES • BUCKETS • CARTS
INSLEY
CONCRETE PLACING EQUIPMENT



For the duration, ⅜ – ½ yd. Insley Excavators will not be available. Concrete and readymix buckets can be supplied.

Bridge Erecting Crane Trucks

(*Continued from page* 49)

controlled crane, to make a 15-ft. bridge section. Completed sections are aligned and overlapping treadways are bolted together.

When three sections have been joined, they are ferried across the stream with an assault boat and fastened on the opposite shore. An amphibious jeep and a bulldozer usually go along on the first trip so they can clear an old road or begin work on a new one. Working back from the opposite shore, Engineers keep on assembling ponton sections and ferrying them across to join the original section. This leaves the near bank clear for the assem-

(*Continued on page* 100)

C.H.&E.

3 Ton Roller

For rolling footpaths, driveways, sidewalks, tennis courts, playgrounds, and general maintenance work. The forward and reverse speed is controlled by one hand lever. Both front and rear rolls can be filled with water. Easy to load on a truck for transportation from job to job.

We also manufacture Saw Rigs — Pumps — Hoists — Bar Cutters and benders.

Write for catalog.

C. H. & E. Manufacturing Co.
3847 No. Palmer St.
Milwaukee 12, Wis.

"Our equipment delivers better job performance with Gulf Quality Lubricants and Fuels"—

says this contractor ★

★ S. J. Groves & Sons Co., Minneapolis, Minn., has two earth-moving contracts in Western Pennsylvania—one a coal-stripping job, shown in the photo at the left, and the other a highway job, shown at the right. The highway contract involves moving over 1,000,000 yards of dirt. Gulf lubricants and fuels are helping this contractor get efficient, trouble-free performance from equipment on both jobs.

"All-weather protection with Gulf lubricants and full power with Gulf fuels are helping us get maximum yardage," says the contractor on the highway and strip-mining jobs shown above.* In spite of day-to-day changes in operating conditions, our equipment is delivering efficient job performance, and we have avoided delays caused by mechanical failures."

The progress and profit on any dirt-moving job depend to a large extent on the efficiency of the equipment that does the work. That is why many leading contractors have adopted Gulf quality lubricants and fuels as basic job insurance — they know from experience that equipment performs better, stays on the job longer, and operates at lower expense for maintenance.

Call in a Gulf Service Engineer before you start your next job — let him help you get better lubrication and more efficient equipment performance at no additional cost! Write, wire, or phone your nearest Gulf office today.

GULF

Gulf Oil Corporation
Gulf Refining Company
Gulf Building, Pittsburgh 30, Pa.

Sterling's

"EASY WHEELING" PREDECESSOR

For centuries, the wheelbarrow has been a common means of passenger transportation in China. The large wheel reduces rolling resistance, and only a minimum of weight is thrown on the operator's arms.

Today, Sterling Wheelbarrows continue to apply that same logical, labor-saving principle. Sterling "Easy Wheeling" features provide a simple, flexible means of material transport. On small, everyday jobs, or on huge war projects, Sterlings fill the bill, economically.

Should you require wheelbarrows in the present emergency, write us. We'll TRY to take care of your needs.

STERLING Wheelbarrow Co.
Milwaukee 14, Wisconsin

Sterling S
Look for this Mark of STERLING Quality
WHEELBARROWS

A 4359-3/6

(*Continued from page 98*)

bly of sections as successive carriers pull into position and cranes set them up. Finishing touches include setting out a dozen heavy anchors about 50 yd. upstream to brace the bridge against the river current.

It is sometimes necessary to position treadways from a high bank or cliff to a point lower than that attainable with the regular crane chains. Then the cable from a Heil double-drum winch, which is mounted just behind the carrier's front bumper, is threaded through a fairlead at the rear of the truck and through a snatch-block fastened at the end of the crane's load chains so that equipment can be lowered far beyond the normal range of the boom.

★ ★ ★

Concrete-Steel Barges

(*Continued from page 73*)

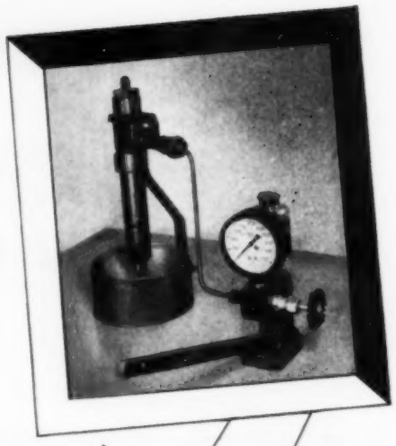
prove the adequacy of the bond between the concrete and the steel frames.

Hull design as exemplified by the 200-ton barge, with molded dimensions 85x22x9 ft., utilizes transverse welded steel frames on 1-ft. 3-in. centers from bow to stern. As shown by one of the accompanying photographs, steel bars in the bottom are threaded longitudinally through the perforations in the webs, and rods in the sides are threaded diagonally. Rolled steel shapes used in the welded frames have uniform flange widths of 3 in.; their depths vary to meet strength requirements in different parts of the barge. Thickness of the concrete shell between the frames, as already mentioned, corresponds to the depth of the steel shapes. For the central portion of the barge, the flat bottom is 6 in. thick, and the sides are 3 in. thick. Thicknesses differ in the raked forebody and stern sections, the forebody having 4-in. floor and sides and the stern 3-in. floor and sides. The barge has 215 tons cargo capacity and 320 tons displacement at 8½-ft. draft.

Fabrication and Launching

Steel framing first is assembled on land, as indicated by one of the photographs, and then is lifted in sections on to concrete posts set up in the river to support the frame above the water. In

(*Continued on page 102*)



ADECO

NOZZLE TESTER

KEEP DIESEL ENGINES RUNNING AT PEAK EFFICIENCY

With this sturdy, portable, lightweight Adeco Nozzle Tester, any mechanic can easily make quick, accurate tests on injector opening pressure, spray pattern, etc. and detect stuck needle valves and leakage around valve seats. Adeco advantages have made this America's most widely used nozzle tester. Tests both large and small injectors, on bench or engine. Avoids costly delays and possible damage to engine. Keeps diesels operating at peak efficiency.

Write for new illustrated bulletin.

ADECO

AIRCRAFT & DIESEL EQUIPMENT CORPORATION
4401 NORTH RAVENSWOOD AVENUE
CHICAGO 40, ILLINOIS

BETTER

BALANCE

HOUGH

"HUFF"

Tractor Shovels

ARMY NAVY

Road Sweepers

HOUGH

Cable-Operated Tractor Shovels For International T-6, TD-6, T-9 and TD-9 Tractors

Hough cable-operated shovels are extremely easy to operate because of proper balance and easy to maintain because of fully enclosed clutches and brakes. The automotive type main drive from engine crankshaft to hoist through hardened steel gears and propeller shaft equipped with universal joints eliminates chains and belts. Clutches, brakes, gears, bearings, etc. are oversize and of ample capacity for the most abusive service. Raising time of loaded ½ or ¾ yd. bucket is 9 seconds, and lowering time only 2 seconds.

These rugged, time and cost lowering shovels have proved economical in *cost-per-yard handled.* They are shipped completely mounted—ready for operation. Write for descriptive bulletin or call your nearest International Industrial Tractor Dealer.

THE FRANK G. HOUGH CO.
Libertyville, Illinois
"Since 1920"

A BULLDOZER—BY QUICK CONVERSION

In less than 10 minutes the buckets can be removed and bulldozer blades attached. Both straight and reversible blades are available. All blades are equipped with hardened reversible cutting edges. Mushroom type grading shoes are standard equipment. Blades can be quickly set to angle right or left, or for bulldozing straight ahead. *Maximum ruggedness is inbuilt.*

There are over 3000 Hough Tractor Shovels in Service

HOLD THAT LINE WITH A
"FIST-GRIP"
1. have 4 bearing surfaces for full rope efficiency.
2. do the job better with fewer clips.
3. keep rope straight and in good condition.
4. are easier, faster, safer to install.
5. save time, tools, and money.
LAUGHLIN SAFETY CLIPS
...NOT WITH A
"FINGER-PINCH"
1. lack bearing surfaces necessary for full rope efficiency.
2. waste clips.
3. crimp and bend rope.
4. go on harder because of adjoining nuts.
5. waste time, tools, money.
ORDINARY U-BOLT CLIPS

UNIQUE-DESIGN CLIPS PRESERVE WIRE ROPE

Laughlin "Fist-Grip" Safety Clips work like automobile brakes; the more frictional surface, the less pressure necessary to do the job.

Laughlin Safety Clips have identical saddles and flat sides to hold the rope firmly and securely by friction without crushing it. Identical saddles fit snugly against the "live" and "dead" ends. Four bearing surfaces deliver full rope power with fewer clips.

Compare their design with that of U-bolt clips with their single bearing surfaces. Notice U-shaped bolt must be tightly drawn against "dead" end, forcing the "live" end into saddle. It has little frictional surface but does its work by burying its rounded surface into the rope, kinking or crimping the wires.

Use the clips that are kind to your rope. Why chance accidents or damage to your ropes? Laughlin Safety Clips are fool-proof. Get complete details in descriptive folder.

Distributed through Mill, Mine and Oil Field Supply Houses

FORGING A SHARE IN VICTORY

THE THOMAS LAUGHLIN Company

PORTLAND 6, MAINE

Look for Laughlin Products in Powers' Road & Street Catalog.

(*Continued from page* 100)

this position, longitudinal members are welded in place to complete the framework, reinforcing bars are threaded through the perforations, forms are attached, and concrete is cast between the frames.

During this stage of construction, two rows of concrete posts, 12 in. thick and about 8 ft. tall, support the barge above tidewater. When ready for launching, jacks are inserted between the wharf and the sides of the completed barge. At the proper time, when the tide is about 3 ft. below the bottom of the barge, the jacks are operated to push the barge outward and overturn the concrete posts. A movement of 6-in., half the width of the posts, is sufficient to push them over.

Launching by this method is quick, taking only about 5 min. Before adopting the procedure, calculations were made and verified by experiments to ascertain the force of impact and depth of immersion. To overturn posts of 8-ft. height and 6-in. radius, the jacking force required is about one-sixteenth of the light weight of the barge. This requirement is well within the capacity of two hand-operated jacks, but four jacks are used to meet any emergency.

★ ★ ★

Three-Span Bridge

(*Continued from page* 71)

from the United States was treated with a 50-50 mixture of creosote and petroleum oil before shipment to the job. The main piers, Nos. 2 and 3, consist of 25 piles each and piers Nos. 1 and 4 of 16 piles each. Native spruce piles treated with a waterborne salt preservative were used.

The stream at the bridge site is rapid flowing and at normal water takes a winding course in a channel roughly 200 ft. wide. During the winter it freezes solid across most of its surface, leaving only narrow flow, about 6 ft. deep down the main channel, which is covered at the deepest point with 3½ ft. of ice. Foundation conditions at the site were investigated by boring at four points across the channel and by driving two test piles.

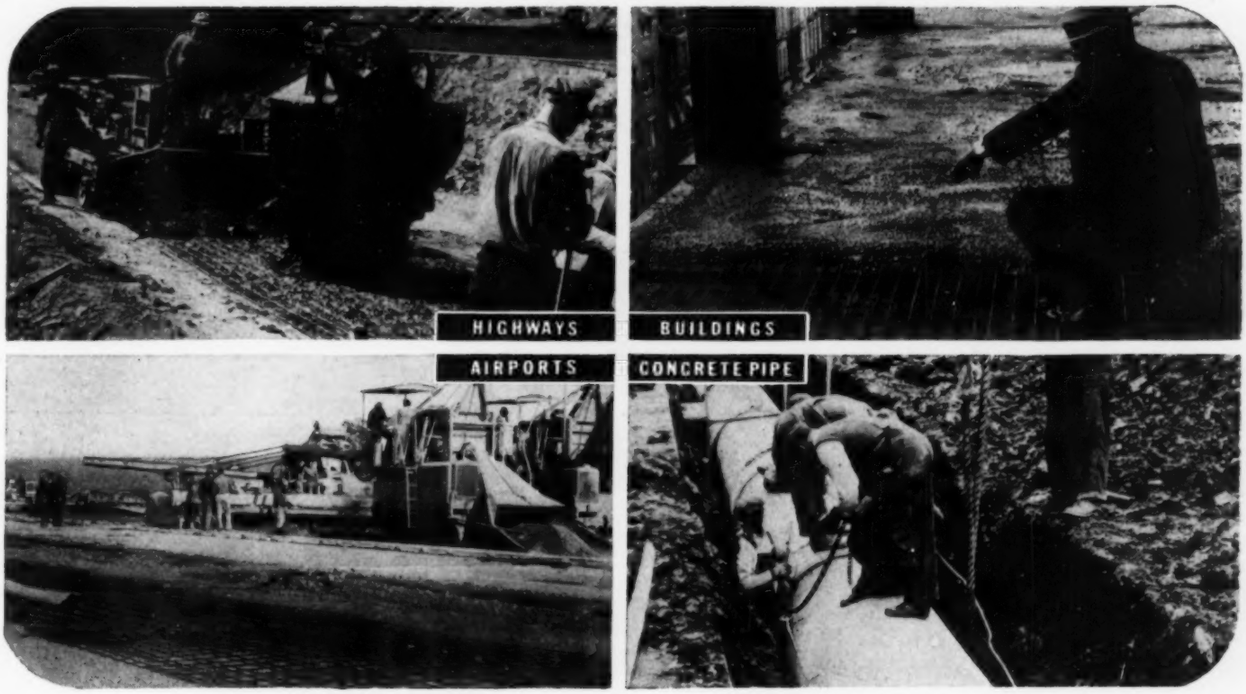
Approaching the bridge from the south the road drops into the Sikanni Valley on a steep gradient on a shelf cut into the loose material formed below a 350-ft. shale cliff. The road enters the bridge, which is skewed 30 deg. upstream on a

(*Continued on page* 104)

Billions of square feet

OF AMERICAN WELDED WIRE FABRIC

used in past decade to reinforce concrete



IN concrete floors, roofs and walls—airport runways and aprons—roads, sidewalks and pipes, American Welded Wire Fabric provides a backbone of steel that weaves strength into the concrete slab in every direction.

Where wire fabric is used, construction time is cut, costs are reduced and a permanently safe, long-lasting structure is assured. This product is convenient to handle, is installed quickly—always stays in place. Architects, engineers and contractors have found high-yield-point, cold-drawn welded wire fabric the ideal material for concrete reinforcement, as evidenced by the billions of square feet used during the past ten years.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Export Company, New York

AMERICAN WELDED WIRE FABRIC

UNITED STATES STEEL

(*Continued from page* 102)

tangent, on a 30 deg. curve. The approach from the north leaves the road on a 10-deg. curve right, follows a tangent for a short distance, then turns left on a 15-deg. curve, and enters the bridge on a 78-ft. tangent. To lessen the height of the fill on the approach from the north and to gain elevation to climb out of the valley on the east bank, the bridge is constructed on a 3 percent grade. The deck is 40 ft. above high water at midstream, giving a clearance of about 16 ft. The design was not affected by navigation requirements since the river is not navigable by large boats at any time.

Layout and substructure details were prepared in the office of the Public Roads Administration at Fort St. John. Contract for the entire bridge job was awarded to Pederson Bros., Inc., of Montevideo, Minn. Surveying and staking of approaches and piers began in October, 1942.

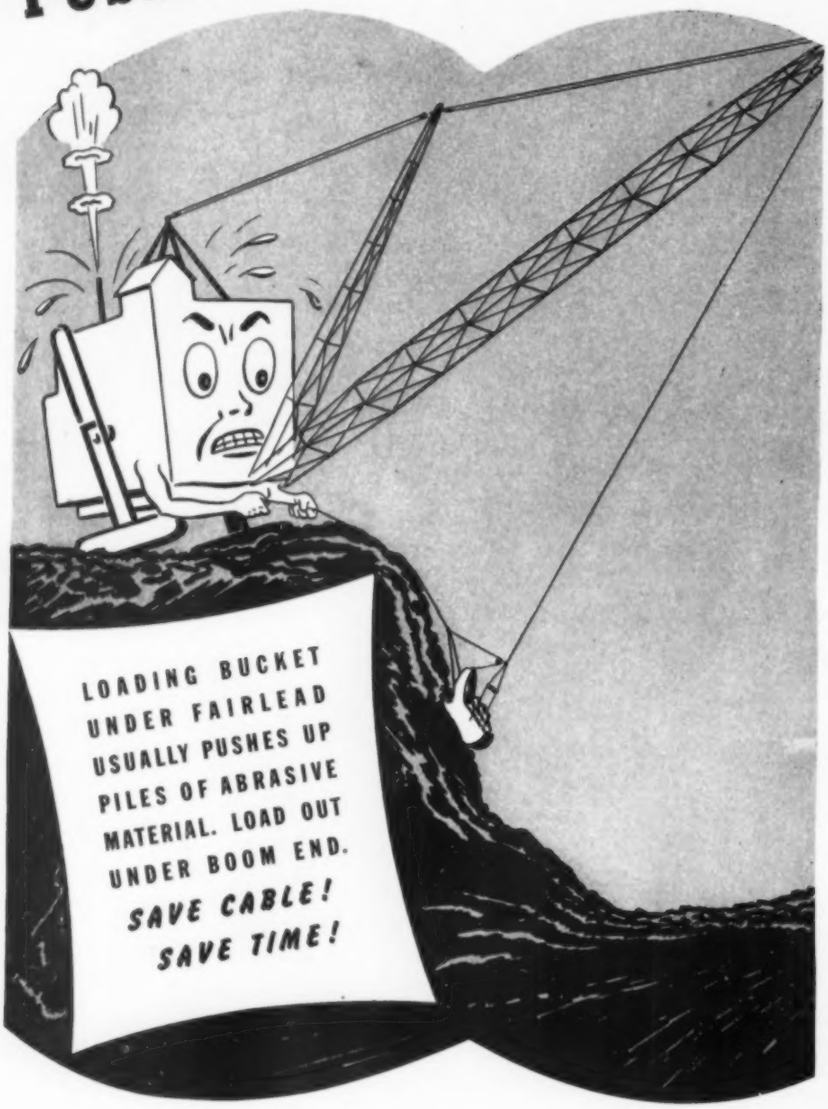
Piles Trucked 56 Miles

Native spruce timber for piles for the piers and approach bents was cut at Army Milepost 60 in October. Piles were trucked 56 mi. over the road to the bridge site, where they were peeled and mop treated with water-borne salt preser-

(*Continued on page* 106)

DRAGLINE PRODUCTION TIP NO. 3

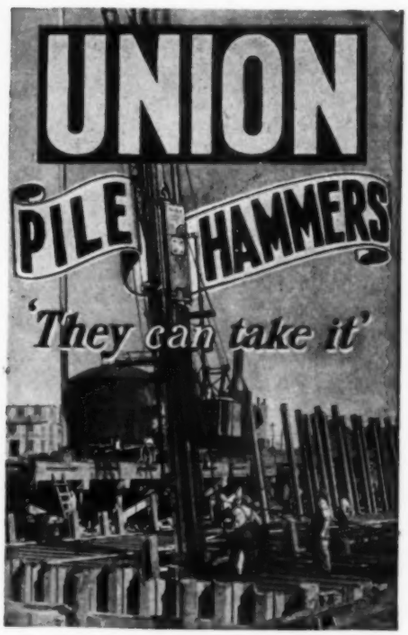
AVOID PUSHING UP A WINDROW!


LOADING BUCKET UNDER FAIRLEAD USUALLY PUSHES UP PILES OF ABRASIVE MATERIAL. LOAD OUT UNDER BOOM END.
SAVE CABLE!
SAVE TIME!

A Page *Automatic* Dragline Bucket *digs* instead of scraping up its load. Free of any "bulldozer" action, a Page *Automatic* Bucket does *not* push up abrasive windrows. It *digs* and *carries* a full pay-load with every pass!

PAGE *Automatic* DRAGLINE BUCKETS

PAGE ENGINEERING COMPANY, CHICAGO 38, ILLINOIS



Ready! —for quick reference and ALL FACTS on what UNION makes for speedy plant construction — write or wire NOW for Catalog 184E.

EST. 1900
Union Iron Works, Inc.
ELIZABETH, New Jersey

A job can be waiting for him

BUT WE MUST PLAN NOW

These days one hears much about plans for post-war and many of us are wondering what we can do about it—how to proceed to be in a favorable competitive position, how to assure plenty of **jobs** for **returning soldiers,** and how to be sure that private enterprise will meet the new conditions.

What the construction industry has done and is doing for the emergency of **war** is a matter of **record.** Its part in the era to come will be none the less brilliant and helpful to the nation, but plans and specifications must be made well in advance of victory.

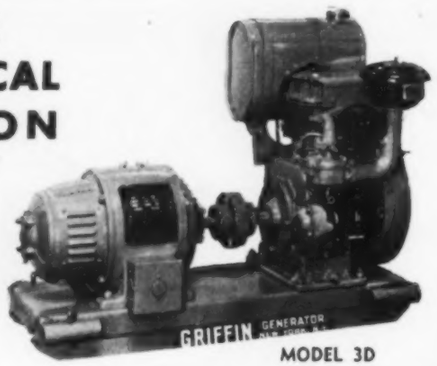
This is the time to plan!—to call in architects and engineers and the general contractor and discuss your building needs for the day that may come sooner than we anticipate. This step taken now not only helps you but it also helps the nation. The **construction industry** has no change-over problem, it **can start immediately** on new construction and modernization whenever plans and specifications are approved, but planning and making specifications take time and much of it can be done now thus saving valuable time when peace is declared. **This is blueprint time!**

THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA, INC.

NINETY CHAPTERS AND BRANCHES THROUGHOUT THE COUNTRY
NATIONAL HEADQUARTERS—MUNSEY BLDG., WASHINGTON, D. C.

SKILL, INTEGRITY AND RESPONSIBILITY IN THE CONSTRUCTION OF BUILDINGS, HIGHWAYS, RAILROADS AND PUBLIC WORKS

GRIFFIN FOR
• ECONOMICAL
• OPERATION



MODEL 3D

• Engineered and built to give you the same dependable Long Life as all Griffin products. Stands up under toughest usage on construction jobs Simple design.

This small plant requires no introduction. No gadgets to get out of order—needs no regulation. Start the engine and plug in. All users will testify to its economical operation and sturdy construction. Don't install large lines of poles and wires where this Generator will do the trick. Direct current—120 volt—3 KW.

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New **CLIPPER**
PORTABLE
HOISTS

OPERATED ENTIRELY BY ONE MAN

UNLOADS AUTOMATICALLY!

Your materials can be handled faster and at less expense with Clipper Hoists.

It's almost like having a "Rubber Arm Hod Carrier," who from his position on the ground can reach to any point on your scaffold.

Easily attached to any Scaffold plank for handling Brick, Tile, Mortar, Lumber, Flue Lining or most any other object.

Built by the makers of Clipper Masonry Saws . . . available on TRIAL . . . Immediate shipment of any quantity.

Write for job Photographs

THE CLIPPER MFG. CO.
1000 SOUTH VANDEVENTER
SAINT LOUIS, MISSOURI

(Continued from page 104)

vative at the rate of 21 lb. per m.b.f. About half of the piles arrived on the job early enough in the season to be treated according to the specifications of the company supplying the preservative. After Nov. 1 the weather became colder and temperatures varied from zero to 20 deg. below. The piles that arrived after Nov. 1 were frozen and had to be heated before peeling and sheltered during treatment. Tests made in April, 1943, on sections of these treated piles showed an effective penetration of sodium fluoride to a depth of about ¾ in.

The piles varied from 40 to 65 ft. in length with butt diameter of 12 to 20 in., and tip diameter from 8 in. up. The 4x10-in. sheathing for piers was cut from native spruce by the mills at Army Miles 256 and 35. Bracing was of creosote-treated Douglas fir supplied by a firm at Portland, Ore. Hardware was supplied by a Minneapolis, Minn. firm.

The first pile was driven for bent 0 on Nov. 19, after a delay of two weeks during which time the shovel was in use in construction of the cut for the temporary approach from the south. The piles in half bent 0 and bents 1, 2 and 3 were 30, 35, 40 and 60 ft. in length, respectively. Eighteen piles in these bents were completely driven on Nov. 24. All piles were driven to refusal at an average penetration of 15 ft. There was difficulty in lining and holding piles due to shale rock slabs sluffed off into the slope from the rock cliffs.

Piledriving Operations

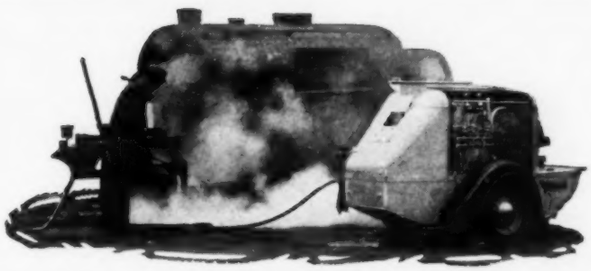
The bents for the approach from the north which required 65-ft. piles were started on Dec. 12. Piles for Nos. 4, 5, and 6 were driven with a crane located on the bank of the river. Piles for bents 7 and 8 were driven from the fill, work being completed Dec. 19. These piles were driven to refusal at an average penetration of 25 ft. below the original ground line. At this time the temperature varied between 20 and 30 below zero, making it necessary to blast the frozen layer of ground before driving was started.

The piles in pier No. 1 were driven between Nov. 25 and 28. All 16 45-ft. piles were driven with shoes to refusal at 23 ft. Action of the piles conformed with sounding No. 1 which showed a soft to firm layer of shale at 24 ft. Twenty-five piles for pier No. 2 were driven from Nov. 30 to Dec. 4. These 55-ft. piles averaged 25-ft. penetration. Tests indicated these piles to be safe for a load of 20 tons or more. Some trouble was encountered in holding the piles in line, possibly due to large boulders which were indicated by boring No. 2 taken at this pier.

Pier No. 3, the other ice-breaker pier

(Continued on page 108)

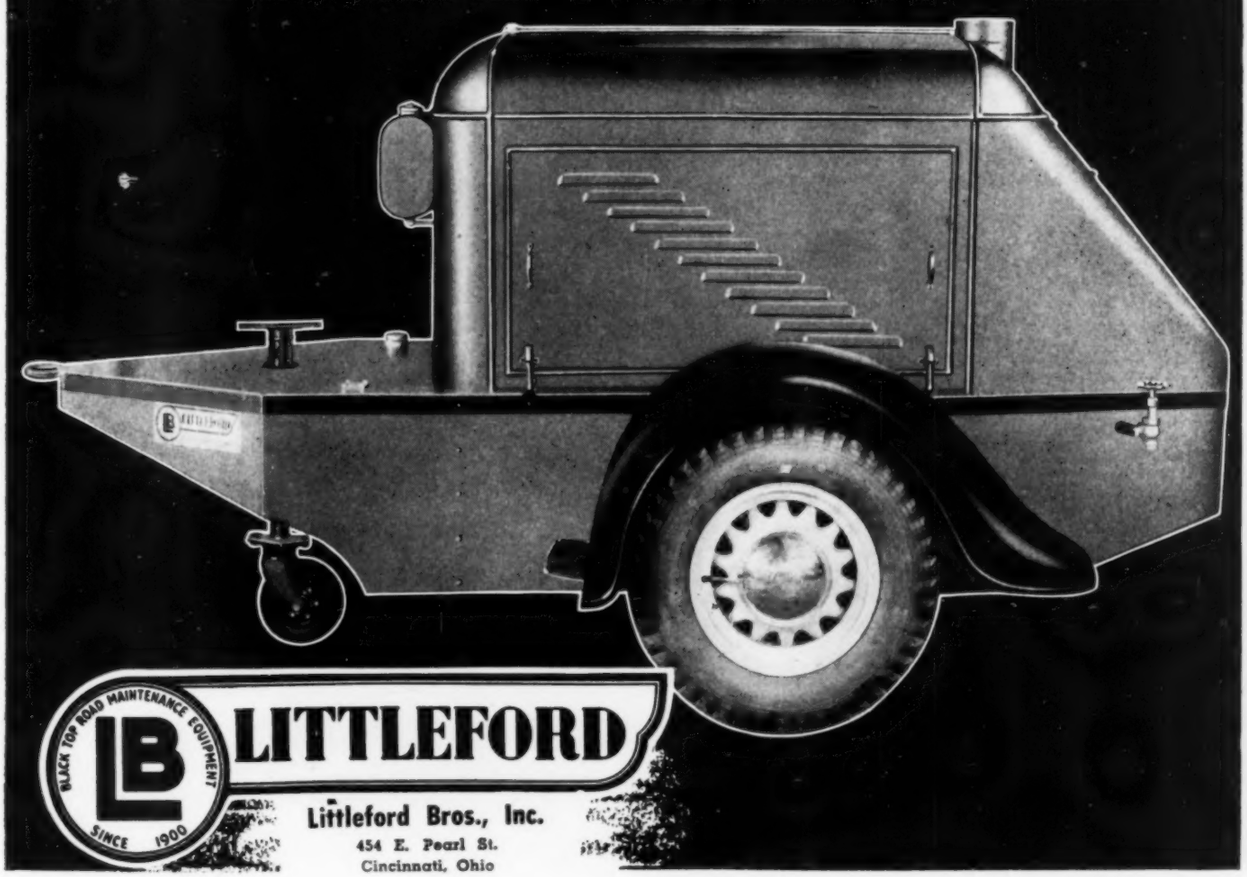
"TANKAR" HEATER



The Littleford "Tankar" Heater is the fastest steam producing unit ever designed. It will develop steam in two minutes' time. "Tankar" Heater will heat tank cars in 1/3 less time than ordinary units.

This Littleford Unit can also be used to clean motors, engines, all types of Road Equipment, platforms, garage floors, walls, etc.

"Tankar" Heater is small, compact, completely automatic, easy to trail. For a modern fast tank car heating or equipment cleaning unit, be sure you use this Littleford "Tankar" Heater.



LB — BLACK TOP ROAD MAINTENANCE EQUIPMENT — SINCE 1900

LITTLEFORD

Littleford Bros., Inc.
454 E. Pearl St.
Cincinnati, Ohio

SAFETY on the Home Front

M-B Motorless Marker striping factory aisle.

Reduce accidents to a minimum, both indoors and outdoors, by systematically striping designated traffic lanes. M-B MARKERS simplify the job. They handle ANY type of striping job — factory aisles, street centerlines, crosswalks, etc. Also handy for marking airports, athletic fields, tennis courts, playgrounds, etc. Quickly convertible to all-purpose paint sprayer for painting park benches, guard rails, traffic signs and other municipal equipment. Two types — motor-driven for all-purpose painting and motorless for striping only. Write for literature.

Meili-Blumberg Corp., Dept. CM-4, New Holstein, Wis.

M-B Motor-driven Marker putting down double line at street intersection.

M-B Motor-driven unit marking single line on airport runway.

MB MARKERS

New and Better Hydraulic Jacks for Heavy Duty!

Simplex No. 30HJ Hydraulic Jack, capacity 30-tons. Has two pumps—high and low speed—which can be operated singly or in unison. Two release valves for convenience. No. 50HJ, same design, capacity 50-tons.

These new 30 and 50-ton Simplex Hydraulic Jacks have been perfected to facilitate the big jobs. Construction is extra-rugged throughout, including base of special analysis steel. Double lever socket facilitates operation in close quarters. Sold by leading supply houses.

Templeton, Kenly & Co., Chicago (44), Ill.

Better, Safer Jacks Since 1899

Other Simplex Hydraulic Jacks are made in 3, 5, 8, 12 and 20-ton capacities.

Simplex LEVER - SCREW - HYDRAULIC Jacks

(Continued from page 106)

of 25 piles, was started on Dec. 6 but work was delayed by difficulties. The penetration of the first 17 piles was 30 ft. on an average but the remaining piles on the upstream side penetrated only about 8 ft. It was decided to excavate to find the obstruction. A ½-yd. clamshell dipper was used for this work. A mass of granite boulders, ranging in size from 6 to 18 in. in diameter, was uncovered and removed. Piledriving was resumed on Dec. 19 and a penetration of 30 ft. below original ground was obtained for all piles. Considerable trouble was experienced in holding the piles in alignment while driving. Sixteen 45-ft. piles for pier No. 4 were driven to refusal without difficulty. An average penetration of 26 ft. was obtained.

There was delay in obtaining treated timber for bracing piers and bents but the work of aligning and spacing piles, spiking sheathing, placing nose armour, and cutting off piles to grade went on during January and February. At the same time, falsework was erected between piers to support truss sections and a temporary pile log runway for the erection crane was built.

During the first two weeks in February the temperature averaged 15 deg. below zero. In the last two weeks of February a prolonged Chinook wind raised the temperature to 52 deg. above zero. Melting snow produced considerable "run-off" which raised the water in the Sikanni Chief River. This forced the ice up above the ordinary level, creating a pressure ridge. To relieve the ice pressure and prevent an early break-up around the bridge where construction activities were being carried on, the ice just below the bridge was blasted and a channel opened, which was kept open for the rest of the winter.

Superstructure Construction

All materials for the superstructure originated in Portland, Ore., and were trucked from the railhead at Dawson Creek via the new highway to the bridge site, a distance of approximately 164 mi. The first shipment arrived on the job Jan. 17. By Feb. 28 all material, with the exception of one carload, was stockpiled at the bridge. Most of the bearing blocks and grills were in the missing carload and erection could not proceed until the missing timbers arrived on Mar. 16.

It was originally planned to fabricate half-truss sections on the ice and raise them into place, but the erection crane was not heavy enough for this job. It was decided to fabricate quarter sections and an extra counterbalance of 330 lb. was added to the crane. The quarter sections

(Continued on page 110)

DRILL
in any position
and at any angle
with the
CLEVELAND
DR30
Pneumatic tires are now unobtainable except for armed forces; DR30 Wagon Drills are regularly supplied with steel wheels only.

★ By merely loosening two nuts, the Cleveland DR30 Wagon Drill can be swung forward or back and from side to side. Then set it as you wish—straight down, flat, breast high, higher than your head, within 4" of ground level, or even straight up. • Here are a few more important features of the DR30:

- ★ **Feed capacity over 8 feet, handles depths to over 25 feet.**
- ★ **Recoil device holds machine to its work, increases drilling speed 10-25%.**
- ★ **Forward leg point holds the drill and steel in line on all kinds of holes.**
- ★ **Centralizer keeps steel from "walking" when starting hole, prevents breakage of bit points.**
- ★ **Twin jack-screw mechanism permits easy moving of U-bar, shortens set-up time.**
- ★ **Main wheels swivel 90° for line drilling, and 180° to obtain narrower tread.**

Write for Bulletin 132 that fully describes the most popular wagon drill ever built.

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THE CLEVELAND ROCK DRILL COMPANY

Division of The Cleveland Pneumatic Tool Company

CABLE ADDRESS: "ROCKDRILL" • CLEVELAND 5, OHIO.

LEADERS IN DRILLING EQUIPMENT

(Continued from page 108)

were fabricated on skids on the river ice and then pulled within reach of the crane which raised them and swung them into position on the falsework. A quarter section was estimated to weigh 9 tons.

The first section was swung into place and left resting on the falsework while the next section was hoisted, fitted into place and held by the crane until the splice blocks of the top and bottom chord were simultaneously bolted and drawn up. The diagonal member then was bolted to the vertical member. Warped members and other defects caused some trouble in bolting the diagonals. Seats for the ring connectors did not always coincide. Jacks, turnbuckles and hoists were used to produce matching of members. The pony bent falsework was built low enough to allow the use of wedges in adjusting the sections for camber.

An end section of each truss was placed first and the other sections added successively and guyed in place. The adjoining truss then was erected, the top and bottom laterals being placed as soon as possible to give stability. The four trusses for each span were erected in full, working downstream from the upstream truss with the exception of the span between piers Nos. 1 and 2. Four clamps were made to facilitate bolting of the large splices in the bottom and top chords. Each clamp consisted of two white oak blocks 6x6 in. by 3 ft., drilled at each end for a 1½-in. bolt 5 ft. long. These blocks were clamped around the splice at the joints and drawn up tight to permit starting the nuts on the splice bolts.

Main Span Erected First

The span over the main flow of the stream, between piers 1 and 2, was chosen for first erection in order to get the equipment off the ice before the spring breakup. Work was started on Mar. 17. Two 11-hr. shifts were started, with one gang fabricating the truss sections at night and the other erecting them during the day.

During the first part of March the temperature was below zero, but when erection began the weather became considerably milder, the temperature reaching 40 deg. above at midday. During erection of the middle span the crane boom was fouled with a guy line and caused damage that delayed progress for 2½ days. The last quarter section of this span was raised into place Mar. 30. The wedges and falsework were removed on Mar. 31.

The erection of the span between piers 3 and 4 moved more smoothly, taking only 7 days, and was completed on Apr. 6. The span between piers 1 and 2 was completed on Apr. 13. A special procedure was used in erecting this span which

(Continued on page 112)

ADDS UP TO TIME AND MONEY SAVINGS

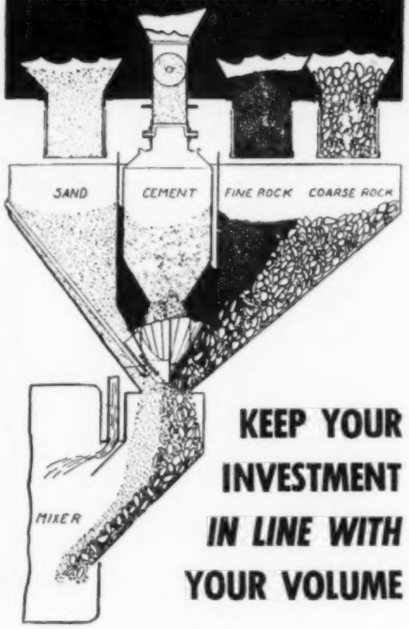
SUPER-VULCAN OPEN TYPE
DIFFERENTIAL-ACTING
PILE HAMMERS
18C, 30C, 50C and 80C

As the piles go down get them there in the fastest time with least effort and with savings in cost. Twice the blows per minute does the job. Each blow takes but one quarter to one third the steam. Things to consider are the rugged strength, positive action, and compactness. The open type fits the same leads and uses the same accessories as the VULCAN single acting Pile Hammers.

Sizes 18C—30C—50C—80C meet all needs

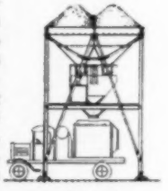
VULCAN IRON WORKS Since 1882
331 North Bell Avenue
Chicago Illinois

JOHNSON Step-by-Step TRUCK MIXER PLANTS

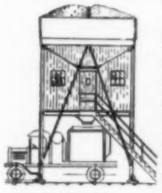


KEEP YOUR INVESTMENT IN LINE WITH YOUR VOLUME

Here's how to plan a central mix plant that holds your initial investment to a minimum, but makes expansion easy and economical. Diagrams at left and right show how a 30 yard Johnson Step-by-Step Bin can be progressively enlarged to 60 yards and 120 yards . . . without discarding a dollars worth of the original plant.



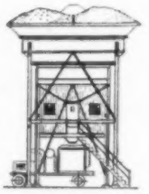
30-Yard 2 Material Bin



60-Yard 3 or 4 Material Bin

The Johnson Concentric Aggregate-Cement Batcher (see diagrams above) gives your plant the important advantage of (1) Pre-mixing, (2) Pre-shrinkage, (3) Faster Discharging, (4) Eliminationof Cement Dust and Mixer Gumming, (5) Centralized Control. Patented design assures a full capacity mixer charge by accurate intermingling of aggregates with the cement when discharged. Many other exclusive capacity-increasing, time-saving, profit-boosting features.

When planning a mixing plant, it will pay you to get all the facts on Johnson *Step-by-Step* Plants. Write us for details.



120-Yard Bin

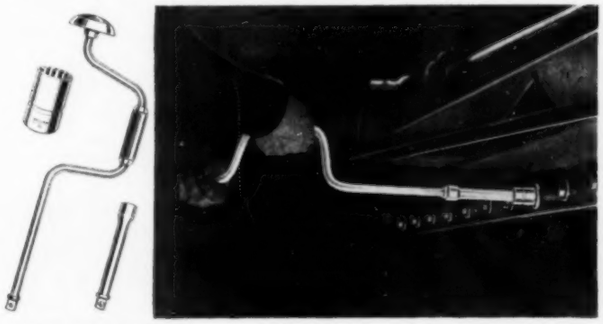
THE C. S. JOHNSON COMPANY
Champaign, Illinois

THE HOW AND WHY OF WILLIAMS DROP-FORGED TOOLS

PROPER SELECTION AND USE OF SOCKET WRENCHES . . Data Sheet No. 24

● Chief advantage of Detachable Socket Wrenches is that they permit the operator to *assemble* a *special* wrench for any particular job. They are inherently safer than open-end wrenches because they grip *all* rather than only two sides of a nut. They are faster when Speeder, Extension-Driver or Ratchet Handles are used. The proper Williams' "Supersocket" assemblies to use for various typical applications are shown.

DELICATE WORK. This thin, straight-walled Midget "Supersocket" with Extension-Driver and Sliding T Handle is fast and sure in these cramped quarters where an ordinary wrench could not even reach the nut.



TIME SAVING. The operator assembling this machine quickly tightens a long row of cap screws while standing erect. The Extension Bar between Speeder Handle and Socket permits continuous rotation since handle clears all obstructions.

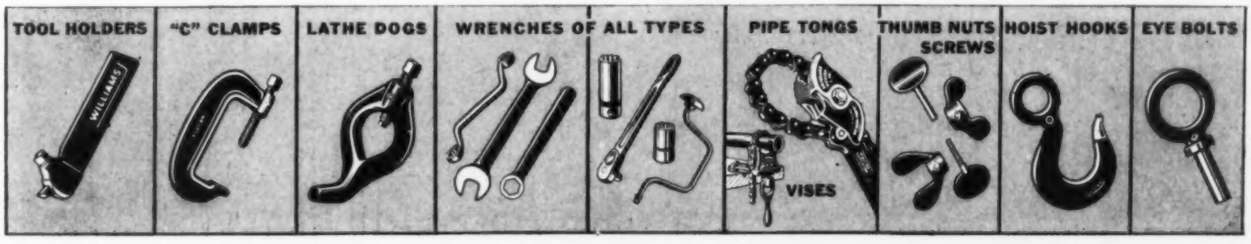
Sold by Leading Industrial Distributors Everywhere

J. H. Williams & Co., Buffalo 7, N. Y.

POWER. Tremendous leverage combined with positive grip result from this Extra Heavy Duty "Supersocket" assembly. These sockets are cross-drilled, thus bringing the Sliding Handle close to the work, minimizing the tendency to tip when Socket is used near the end of handle.

HAZARDOUS JOBS. Working from a ladder, this millwright not only gets at an awkwardly-placed nut with this Standard "Supersocket" combination but he can apply heavy leverage without danger of the wrench slipping and throwing him off balance.

OBSTRUCTIONS. With this "Supersocket" Ratchet and Socket, the mechanic "gets around" obstructions that otherwise would have to be removed to make an adjustment. A 30° swing is all that is needed to rotate a nut with this Handle. "Supersocket" Extensions are likewise very helpful in getting at hard-to-reach nuts.



YOU'LL BE LOOKING FOR NEW EQUIPMENT

WARCO ROAD MACHINERY OFFERS THE RIGHT MACHINE FOR ANY JOB

HYDRAULIC CONTROL MOTOR GRADERS • HYDRAULIC SCOOPS • ROAD ROLLERS • TERRACING GRADERS • ROTARY SCRAPERS • MULTIPLE BLADE ROAD MAINTAINERS.

WARCO Machinery can now be purchased on WPB releases or approval. When normal purchases can again be made give consideration to the WARCO Line, which will surprise you with its versatility and economy.

LET'S WIN THIS WAR
LET'S BE READY FOR PEACE

W. A. RIDDELL CORPORATION
Bucyrus, Ohio

(*Continued from page* 110)

passed over and reduced the clearance on the temporary river crossing. Three sections of each truss were first erected so as to leave the roadway under the fourth section unrestricted as long as possible.

On Apr. 11, at 3 p.m., the water in the river showed signs of rising and the ice was quickly cleared of skids and materials. By 5 o'clock water was running a foot deep over the ice. During April temperatures ranged from freezing at night to 50 deg. F. in the middle of the day.

Construction of Decking

Native spruce for flooring the approaches was supplied from the Muskwa Mill at Army Mile 256. It supplied 2x6-in. flooring in 26-ft. lengths with some 16- and 14-ft. lengths. Tapered pieces were sawed for the curved approach from the south. The truss spans were floored with 3x6-in. creosoted fir in 10- and 16-ft. lengths.

Native timber decking was dipped in a water-borne salt preservative at the site. It was desired to obtain a retention of ¼-lb. of preservative per cu. ft. of timber but tests made two weeks after dipping showed disappointing results. The fluoride salt had penetrated only ⅛ in. A supplementary treatment was applied with a mop just before the flooring was laid.

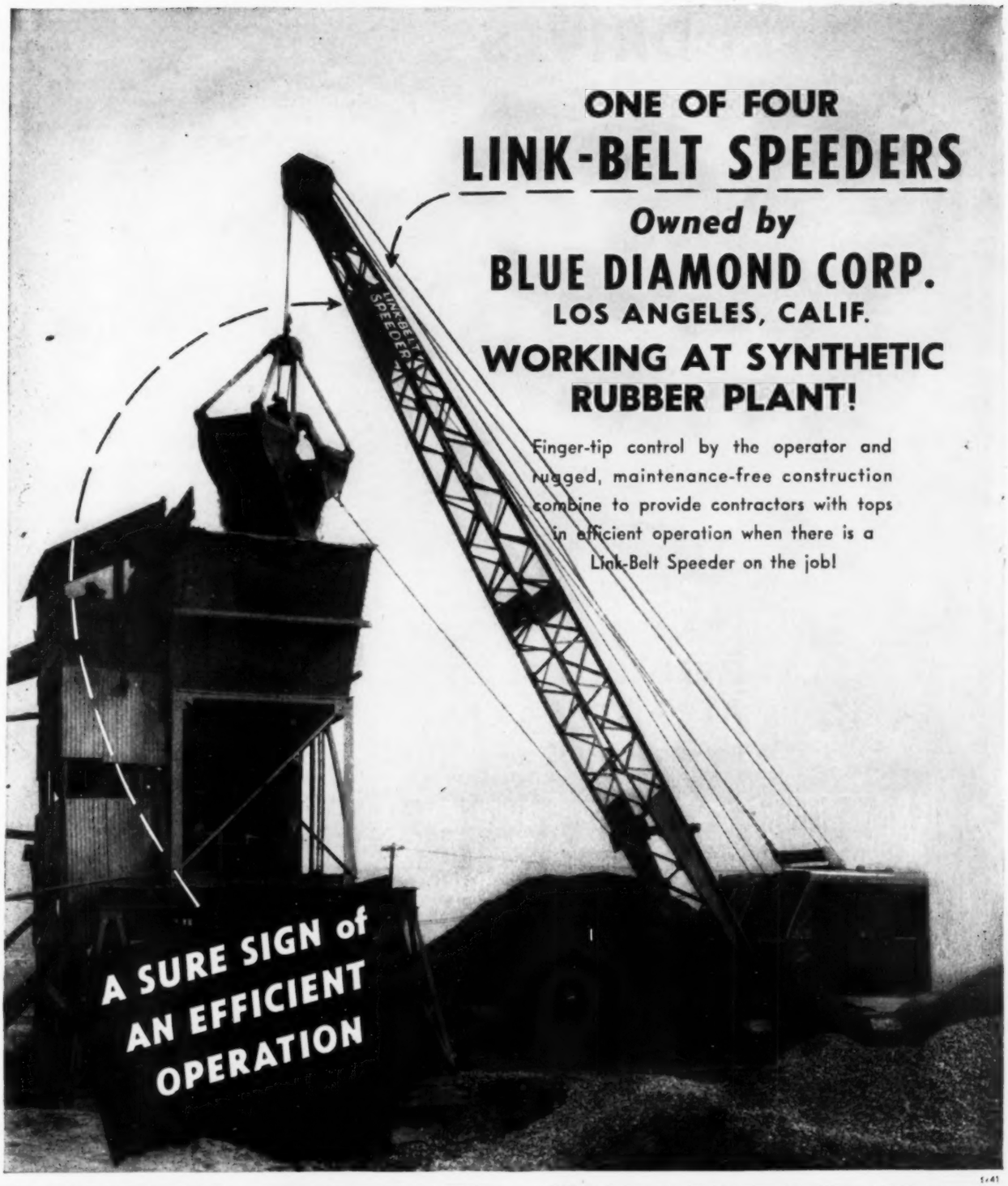
The laying of the floor beams, stringers, treated decking, and erection of rail posts on the trusses was started Apr. 12, working from the west approach. A 22-ton crane was used to swing the floor beams and stringers into place and as the decking advanced all laterals and sway braces that had been left out were hoisted and bolted into place. Work was carried on by two shifts, the day crew doing most of the bracing while the night crew placed the stringers and spiked the laminated decking in place, averaging about 30 ft. per 11-hr. shift. The running plank was nailed in place as the deck advanced. A fire wall was built at pier 3 when the decking reached that point, and another was placed at pier 4, causing some delay in progress on the decking. Two other fire walls on the approaches were erected in advance of decking operations.

On the night of Apr. 19 the last of the decking was spiked in place and the running plank laid. Apr. 20 and 21 were spent lining up wheel guards and rail posts, leaving only the painting and cleaning up of the site to be done. By Apr. 25, the day of the official opening, the bridge was complete in every detail, except for the last finish coat of white paint on the handrails and wheel guards.

The actual time used in constructing the superstructure was 32 days. The total time elapsed from the driving of the first pile to final completion was 23 weeks.

Structural excavation for the job to-

(*Continued on page* 114)



ONE OF FOUR

LINK-BELT SPEEDERS

Owned by

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LOS ANGELES, CALIF.

WORKING AT SYNTHETIC RUBBER PLANT!

Finger-tip control by the operator and rugged, maintenance-free construction combine to provide contractors with tops in efficient operation when there is a Link-Belt Speeder on the job!

A SURE SIGN of AN EFFICIENT OPERATION

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LINK-BELT SPEEDER

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DIAMOND DRIVES

Keeping runways and approaches clean and free of loose articles at Fortress airport.

HELP CLEAN UP AIRPORT AREA

To prevent possibility of serious harm caused by loose stones and metal parts being sucked up by the action of plane propellers, it is important that airport areas be kept clean—a task taken over by such machines as the patrol sweeper shown above.

As on many other types of Austin-Western equipment, DIAMOND Roller Chains perform important functions, driving the sweeping and pick-up brushes, and the pump for the dust-laying sprayer. For such machinery as on other leading makes of construction equipment used at home and abroad,—the long-life ruggedness of DIAMOND Roller Chains,—their reliability and freedom of maintenance cares, have measured up to the stringent requirements of war conditions. DIAMOND CHAIN & MFG. CO., 418 Kentucky Avenue, Indianapolis 7, Indiana. Offices and Distributors in All Principal Cities.

DIAMOND ROLLER CHAINS

(*Continued from page* 112)

taled 100 cu. yd. Used in construction were 6,535 lin. ft. of treated piling; 491,-824 fbm. of creosoted fir timber; 14,180 fbm. of treated spruce timber; 15,618 fbm. of untreated fir timber; and 25,040 fbm. of untreated spruce timber. The superstructure required 76,660 lb. of hardware and the substructure and approaches 12,000 lb.

★ ★ ★

Four Truck Cranes

(*Continued from page* 83)

had been reached, truss erection was handled by only three cranes, one at the center and one at each quarter post of a truss. Close coordination among the crane operators was necessary to maintain equal distribution of loads while maneuvering the trusses into position atop the 35-ft. high walls of the building.

The component parts of the timber trusses were manufactured by the Arch Rib Truss Co. for the Ryan Aeronautical Co. The design of the building was developed by Stanley Burne, consulting engineer, San Diego, Calif.

★ ★ ★

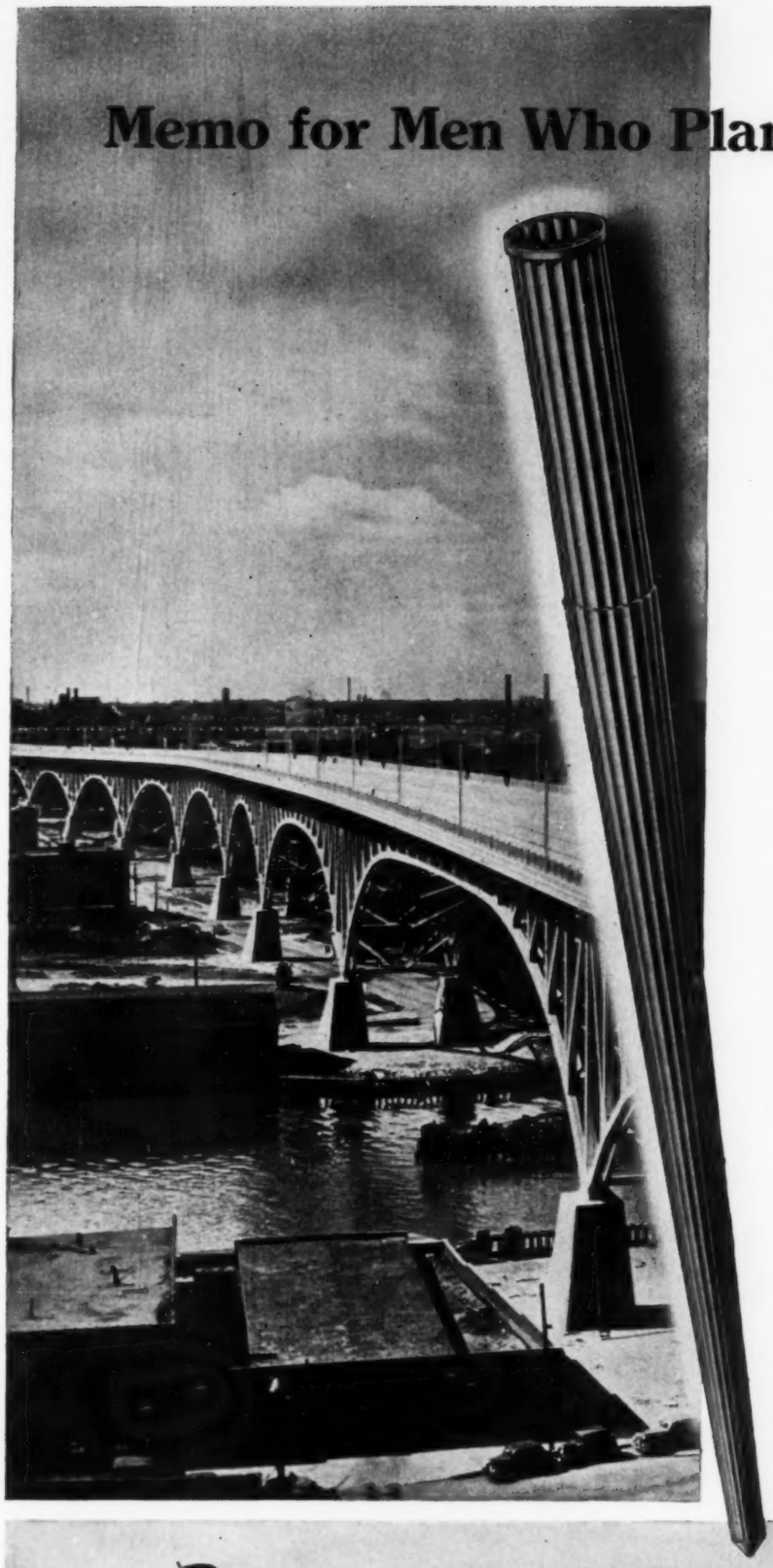
Michigan Builds Expressway

(*Continued from page* 54)

Section 3 traverses property holdings of the Ford Motor Co., the Ford Foundation and Henry Ford. Through the civic spirit and generosity of these interests, the cost of Section 3 to the public is much less than it otherwise would have been. The three property owners deeded about 4 mi. of right-of-way to the State of Michigan, provided 750,000 cu. yd. of free sand borrow and opened disposal areas without charge for wasting 1,500,000 cu. yd. of unwanted soft blue clay. Total value of these three gifts is variously estimated at $3,000,000 to $4,000,000. In addition to supplying right-of-way, Michigan pays 25

(*Continued on page* 116)

Memo for Men Who Plan for Postwar



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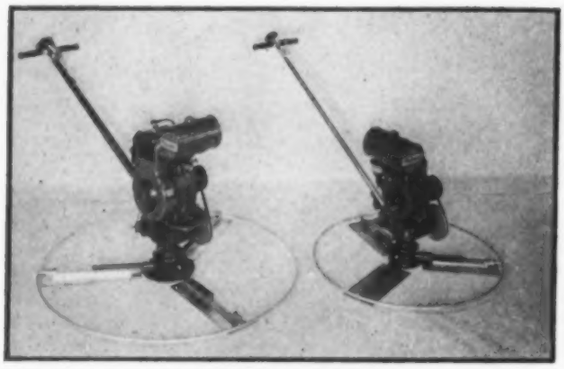

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(*Continued from page* 114)

percent of the construction cost; the remaining 75 percent of construction cost is allotted to the project by the Public Roads Administration from National Defense Highway Act Funds. With a value exceeding $9,000,000 for contracts awarded up to the end of the year, Section 3 stands out as the largest single highway project put under construction in the United States during 1943.

Heavy Overhaul

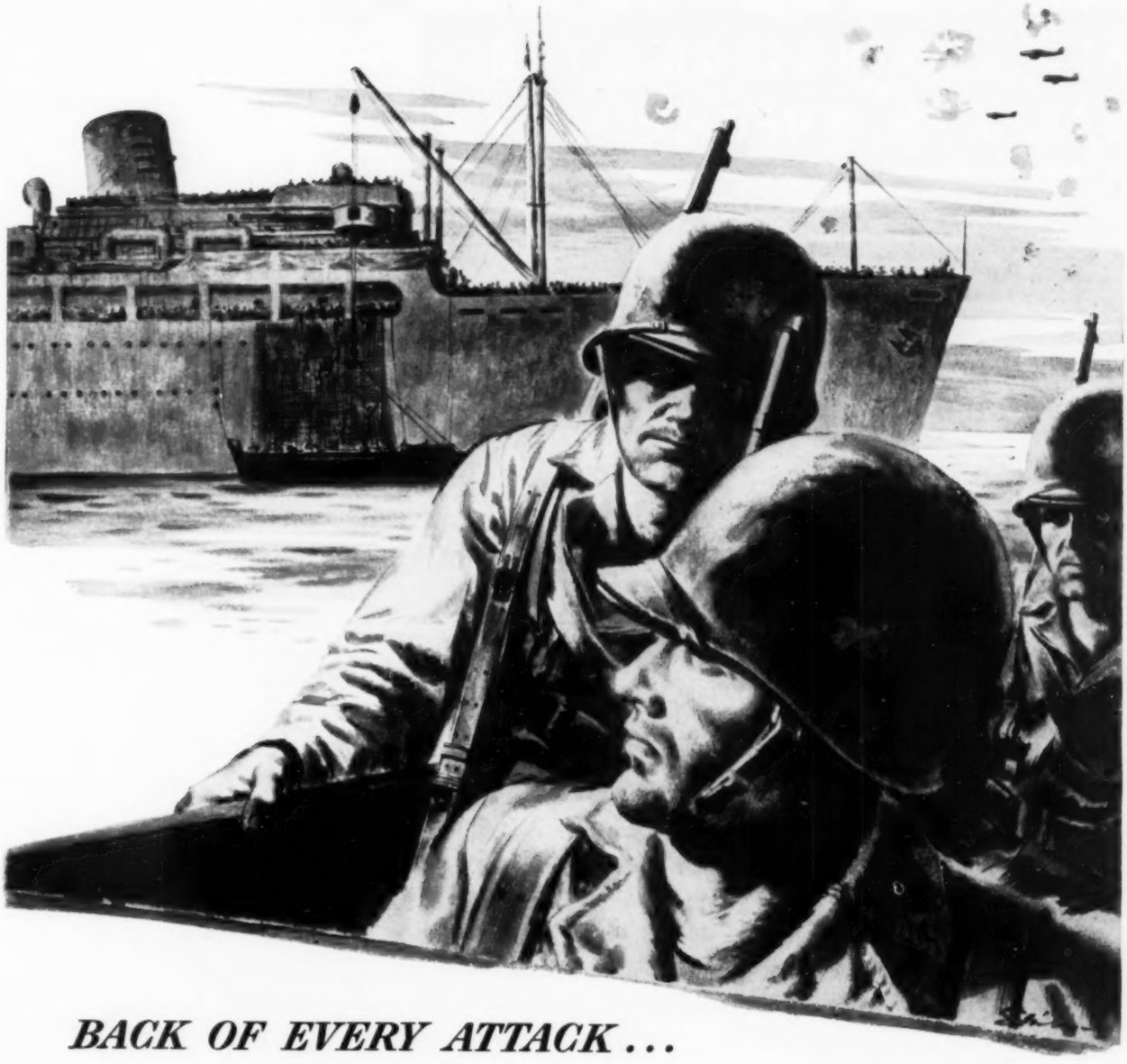
Overhaul is a heavy item on road contracts for Section 3. The accompanying tabulation of data to Feb. 15 shows more than 6,200,000 cu. yd.-mi. of overhaul in relation to 2,660,000 cu. yd. of excavation. For the 15 road contracts put under construction prior to October, overhaul amounted to 3,500,000 cu. yd.-mi. and the quantity of excavation was about 2,000,000 cu. yd. Of the latter item, roughly 750,000 cu. yd. was sand borrow for highway fill and pavement base. Most of the overhaul mileage was expended in transporting this sand borrow, which had to be trucked an average one-way distance of 3 to 4 mi.

In the raised-grade portion of Section 3, highway embankment was built up from exposed subsoil after topsoil had been stripped and stockpiled for later use in surfacing slopes and graded areas. To support the concrete pavement 24 ft. wide, a core of borrow sand was built up on the exposed subsoil to 28.8-ft. top width, with a 1 on 1 slope line separating the sand core from the selected clay placed in the shoulders, as shown by the accompanying road section. No soft blue clay was used in any part of the fill, all of this undesirable material being wasted in disposal areas. In the depressed portion of the expressway, existing clay is removed and replaced with sand to provide a minimum of 2 ft. of porous, granular supporting material for the ultimate three-lane pavement on each roadway, as shown by another cross section drawing reproduced with these notes.

Contract Schedule

Bids were taken and contracts were awarded in April, May and June for bridges, grading, drainage and paving on the westerly 3 1/3 mi. of Section 3 from Southfield Road to Greenfield Road, and construction of this portion was pressed by the State Highway Department and its contractors with such success that the freeway was opened to traffic as far as Greenfield Road on Dec. 8. Completion to this point is indicated on the accompanying map. Two temporary directional traffic connections at Greenfield Road have converted this grade separation into an interchange for current use until the

(*Continued on page* 118)



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(*Continued from page* 116)

easterly portion of Section 3 can be completed and opened to traffic this summer. Included in the 3 1/3-mi. portion to Greenfield Road are a traffic interchange at Southfield Road, twin grade-separation bridges at Outer Drive, Oakwood Boulevard and Greenfield Road, a pair of bridges over Rouge River and two twin box culverts carrying the expressway pavements over Ecorse Creek.

To the east of Greenfield Road, the expressway passes over an interchange access road serving the Rouge plant of the Ford Motor Co. and passes under seven grade separation bridges carrying four railroads and three highways across the depressed freeway. Two bridges included in the present program for grade separation and traffic interchange at Michigan Ave. are not yet under construction. Temporary service roads and loops are to be built at this location to facilitate traffic interchange until the structures can be erected. Current construction on the depressed portion of the expressway was placed under contract between June and Feb. 15 of this year. It is expected that the final contract will be completed in time to open the entire 5.8-mi. length of Section 3 to traffic by next fall.

Grading and Paving

Three grading, drainage and paving contracts carried the expressway from the end of Section 2 to Rouge River. The three contracts, each measuring a little less than a mile in length, were awarded to Taylor Bros. Co., Inc., Birmingham, Mich.; Oak Construction Co., Royal Oak, Mich.; and Bridgeport Core Sand Co., Saginaw, Mich., and Louis Garavaglia & Son Co., Detroit, co-contractors on the most easterly of the three projects. Charles J. Rogers, subcontractor, Detroit, did the grading and drainage construction for Taylor Bros., and Louis Garavaglia & Son Co. performed the same work on the Bridgeport-Garavaglia contract. The Oak Construction Co. took care of its own grading and drainage operations. For ⅝ mi. east of Rouge River, to a point beyond Greenfield Road, the state awarded contracts for grading and drainage structures to Charles J. Rogers and a contract for paving to Taylor Bros. Beyond the Rogers contracts, for 1½ mi. eastward, grading and drainage structures in the depressed portion are being completed by Wilmer Pierson, contractor, Saginaw, Mich.

In starting their grading operations, these contractors stripped topsoil with tractor-drawn scrapers. Sand core and shoulders of selected clay for highway embankments were placed in 12-in. layers, struck off by bulldozers and compacted by pneumatic-tired hauling vehicles and rolling equipment. Some 250 to

(*Continued on page* 120)

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—on Koehring Trail-Dump absorbs road shocks, allows free movement of body for high speed travel over rough haul roads. Trail-Dump can climb 21" furrows without frame distortion. Free, universal action at upper end of hitch yoke allows wagon and tongue to move in any direction without body twisting strains. These important advantages permit high speed travel without penalty of twisting strains, excessive repair costs. High speed travel increases loads per hour, yardage per hour.

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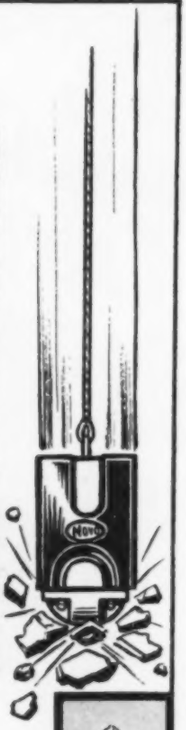
BLOCK BUSTER



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(*Continued from page* 118)

300 trucks carrying 6-7-yd. average loads were used to transport the fill material. For the depressed portion of the expressway, Wilmer Pierson excavates the cuts with a battery of draglines. After digging through a thin top layer of plastic mottled clay, these machines complete the excavation to grade in soft blue clay, which is hauled away to the disposal areas. One part of Pierson's contract cuts through an old city dump previously filled with rubbish to a depth of about 15 ft. Roadway grade is excavated about 9 ft. below the bottom of the rubbish. Sides of this cut are laid back to 1 on 4 slope and are blanketed with 3 ft. of clay. Under the clay blanket at the bottom of the rubbish layer, a 6-in. sewer is laid with open joints in porous granular backfill to intercept the drainage from the pervious rubbish. The top of the rubbish layer is covered with an 18-in. blanket of clay out to the right-of-way limits, which are 414 ft. apart at this location.

Concrete Pavement

To place the 160,000 sq. yd. of 9-in. uniform-thickness, non-reinforced concrete pavement on their four contract sections, the three paving contractors employed one paving outfit each. One of the outfits was equipped with a 34E dual-drum mixer, and each of the other two used a 27E single-drum. Water was hauled by tank trucks to all three mixers. Each paving outfit included a self-propelled finegrading machine, a two-screed finisher, a joint machine and a mechanical longitudinal float.

Pavement was placed to full 24-ft. width, and a longitudinal slot was formed along the inside edge of the slab to make a keyed construction joint with the future third lane. Transverse expansion joints of premolded material ¾ in. thick were installed at 120-ft. spacing, the joint filler being set ½ in. below pavement surface and the top of the joint being completed later with hot-poured asphaltic material. The joint machine cut a longitudinal center-line construction joint and installed ribbon-type filler flush with the surface. Transverse contraction joints were cut by the same machine at 20-ft. intervals between expansion joints and were filled flush with strips of premolded material. An impervious membrane curing compound was applied to the surface of the concrete by spraying to retain moisture during the curing period.

Air-entraining cement specified for the concrete to increase durability and scale-resistance contained about 0.15 lb. per barrel of Vinsol resin ground with the clinker at the cement mill. Addition of this material to the cement introduced minute air bubbles into the concrete and reduced the weight per cu. ft. by about

(*Continued on page* 122)

This newest hangar of the Pan American World Airways System, in Miami, has five acres of floor space. Covering two and one half acres of land, it contains three office sections of four floors each and is the largest hangar for land-based planes in the Pan American System.

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RANSOME 34E
Dual Drum
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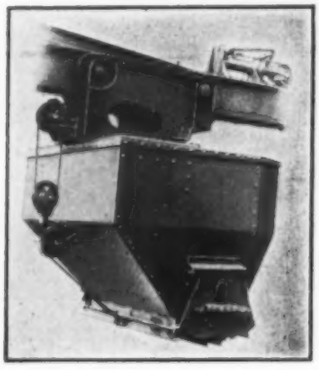

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SUBSIDIARY OF WORTHINGTON PUMP AND MACHINERY CORPORATION

(*Continued from page* 120)

5 lb., well within the weight-reduction limits of 4 to 8 lb. allowed by Michigan specifications. Both limestone and slag coarse aggregate were used by the contractors. The coarse aggregate was separated into two gradations, of 2½-in. and ¾-in. maximum size. Because of the air-entraining characteristics of the cement, the concrete mixes were plastic and cohesive and were free from surface bleeding and sedimentation, enabling the finishers to work closely behind the paving mixers.

Construction conditions on the four contracts were not particularly conducive to production of large daily yardages. Under Michigan specifications, the required mixing time per batch was 60 sec. The largest day's output for the 34E dual-drum mixer was 695 cu. yd., and the two 27E single-drum machines turned out maximum one-day production of 455 and 405 cu. yd., respectively.

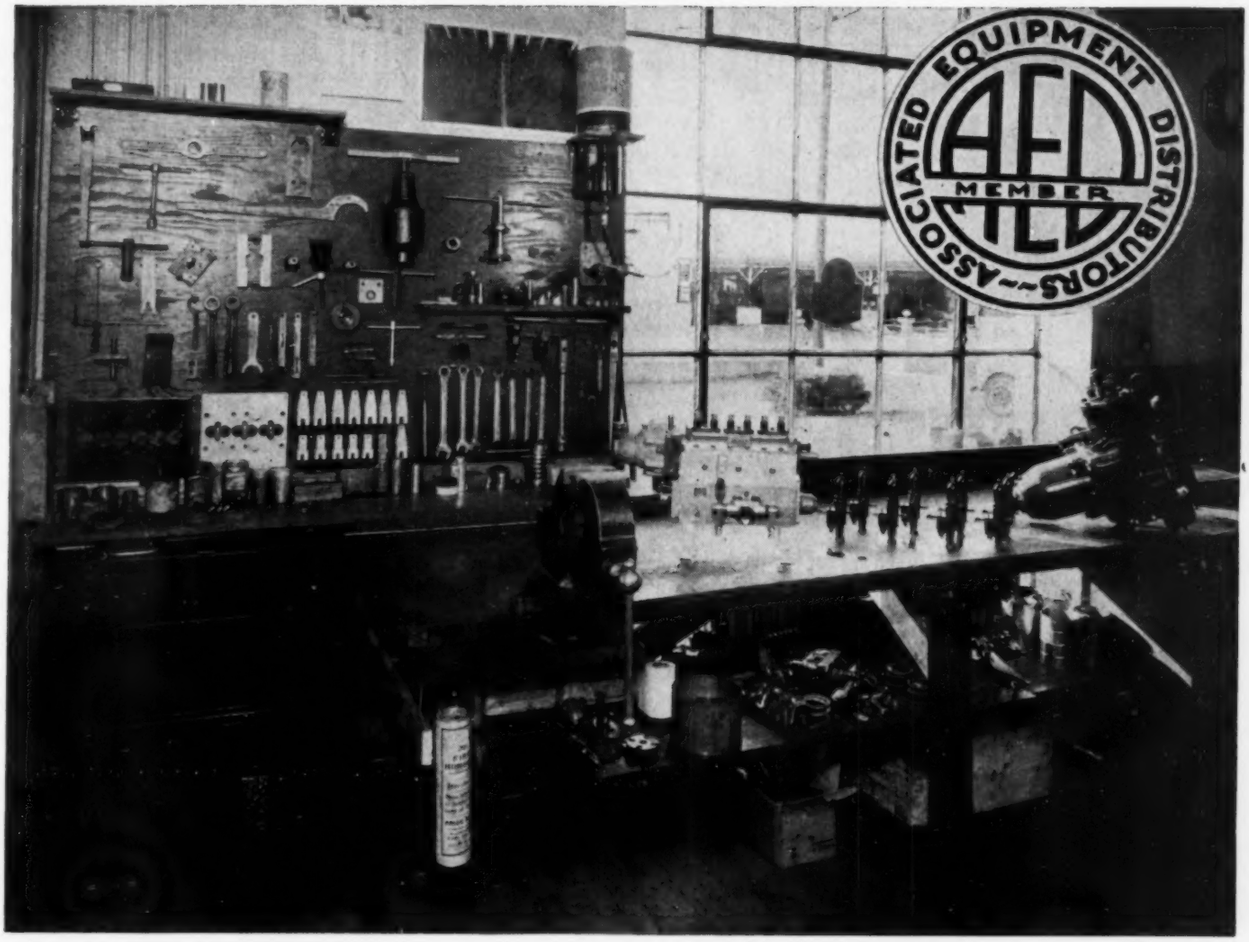
Expressway Bridges

Ultimate development of Section 3, including the grade separation and interchange at Michigan Ave., involves a total of 34 bridges, of which 24 are at present completed or under construction. Five of the present bridges are steel plate girder structures carrying railroad tracks. Four of the remaining 19 provide stream crossings for the expressway, two at Rouge River and two (twin box culverts) at Ecorse Creek. With the exception of the two twin box culverts, the 19 bridges are reinforced-concrete T-beam structures, twelve designed as continuous beams and five as cantilevers.

Because of special conditions at their locations, five of the bridges in the present construction are supported on spread footings; the remaining 17 rest on piles. Of the latter bridges, 16 are supported on timber piles up to 90 ft. long, creosoted timber piles (one-third at 3 on 1 batter) being used for abutments, where the heads project above the groundwater table, and vertical untreated timber piles for the piers, where the cutoffs are below water elevation. Concrete cast-in-place step-tapered piles, driven to refusal at penetrations up to 90 ft. below the surface of the existing ground, were installed by the Thomas E. Currie Co., contractor, Detroit, at the location of the Rotunda Drive underpass in advance of the reconstruction of a large sewer which had to be depressed under Rotunda Drive at this point.

Batter piles are driven by several methods. A photograph reproduced with these notes shows one method of driving with adjustable leads. Following the main section of this article is a separate one-page story, which illustrates another method of utilizing two cranes to elimi-

(*Continued on page* 124)



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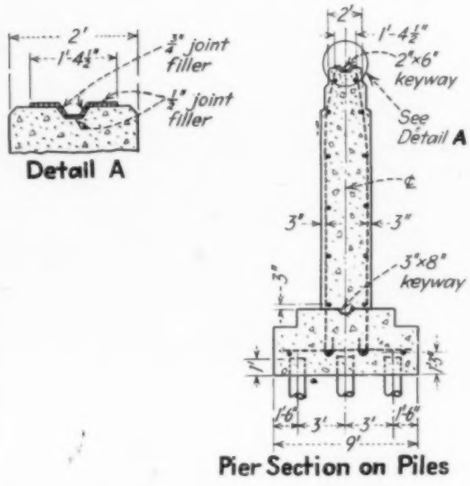
(*Continued from page* 122)

nate need for piledriving leads in putting down batter piles.

Foundation construction for the two expressway bridges over Outer Drive is typical of that at the 16 bridges supported on timber piles. Here the W. J. Storen Co., contractor, Detroit, drove 598 piles up to 74 ft. long for the two bridges, using a No. 2 Vulcan steam hammer to start the piles and a No. 1 to seat them. The hammers were suspended in swinging leads from the booms of two Browning crawler cranes, one carrying a 65-ft.



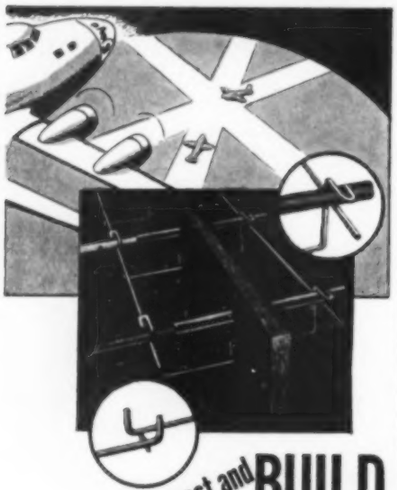
PIER ON PILES is typical of intermediate supports under T-beam decks of most of highway grade separation structures on Section 3. All highway bridges have cast-in-place concrete guard railing of type indicated by details shown.

boom and the other a 60-ft. boom with a 20-ft. extension, giving it an overall boom length of 80 ft. Wood sheeting was used for the abutment and pier foundations in soft blue clay, and steel sheeting was employed for a pump house included in the same contract.

At Oakwood Boulevard, where the Peninsular Construction Co., contractor, Grand Rapids, Mich., built overpass bridges for the divided roads of the expressway, stiff clay of fair bearing value was uncovered at sufficient depth to support the abutments and piers on spread footings of cellular type. The cellular design was employed to give the desired spread with minimum weight of footing, limiting the load on the clay to 2,000 lb. per sq. ft. An accompanying drawing illustrates cellular footing construction.

Spread footings were used for a different reason under the four bridges at the Southfield Road interchange. These four bridges are all within 1,200 ft. of an existing grade-separation structure carry-

(*Continued on page* 126)



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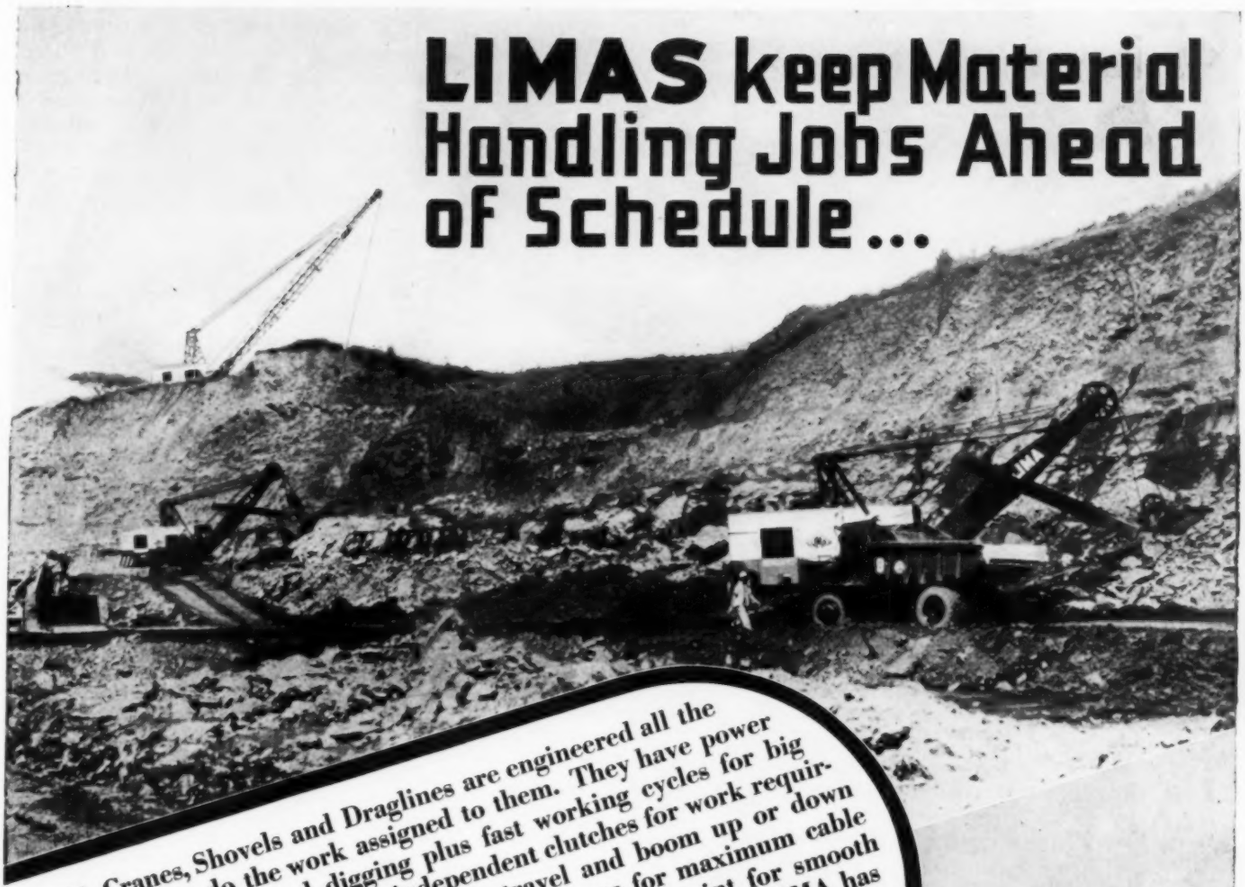

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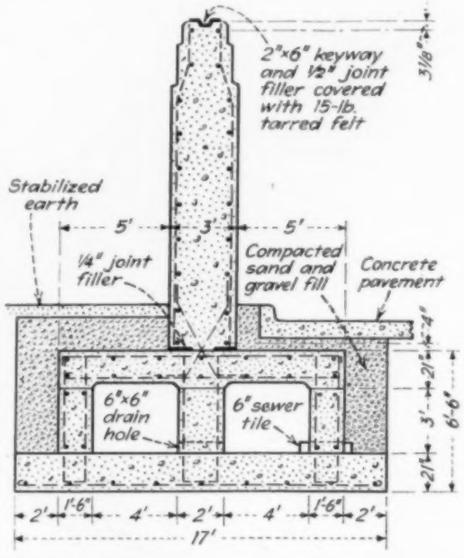
(*Continued from page* 124)

ing the Wabash R.R. over Southfield Road. The railroad bridge is supported on spread footings on clay, and it was feared that driving of piles for the four adjacent bridges might damage the existing foundations. To avoid this danger, the four highway bridges are placed on spread footings with a design loading of 4,000 lb. per sq. ft. In the multiple-span bridges



CELLULAR FOOTING used in earlier construction of grade separation bridge on Section 2 is illustrative of similar footings for two bridges across Oakwood Boulevard on Section 3. Hollow, box-type footing is about equal in weight to displaced soil and gives load distribution of 2,000 lb. per sq. ft. on firm clay bearing.

carrying the expressway across Southfield Road, footings of the five piers in each bridge are stiffened and strengthened against unequal settlement by solid slabs of 18-in. reinforced-concrete pavement base cast between adjacent piers and anchored to them by tierods. For present pavement needs, a 6-in. concrete wearing course has been placed on the pavement base through two of the four spans; in the remaining two spans the pavement base is covered for the time being by stone surfacing on sand-gravel.

Bridge Decks

Decks of all bridges carrying expressway roadways are constructed to full roadway section, with a minimum of 48 ft. inside railings. On the two bridges over Southfield Road, this width is increased to 60 ft., with a 36-ft. roadway flanked by two 12-ft. shoulders. In bridges of normal section, the roadway width is 24 ft., with two 12-ft. shoulders. Each shoulder comprises a 15-in. rolled curb and 10 ft. 9 in. of special shoulder

(*Continued on page* 128)

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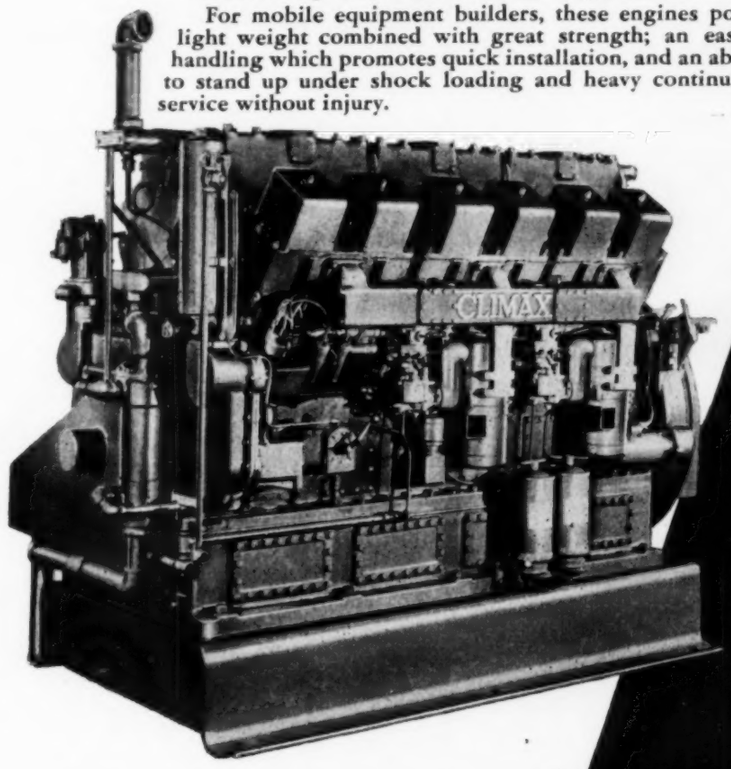


The Climax New V12, a 12 cylinder, 7" x 7" bore, 60° V, 4 cycle type which develops 495 hp. at 1200 r.p.m. Typical uses—deep drilling, construction equipment, locomotives, pumps, compressors, generator drives.

The Climax Model R41, a 4 cylinder 6" x 7" bore, 4 cycle type which develops 100 hp. at 1200 r.p.m. Typical uses—for cranes, shovels, draglines, snowplows, pumps, compressors and generator drives.

"For High Achievement in the Production of War Material"

Climax

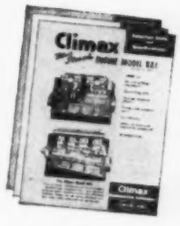
Engineering Company

GENERAL OFFICES & FACTORY: CLINTON, IOWA

REGIONAL OFFICES: CHICAGO, ILLINOIS, DALLAS, TEXAS

SEND FOR

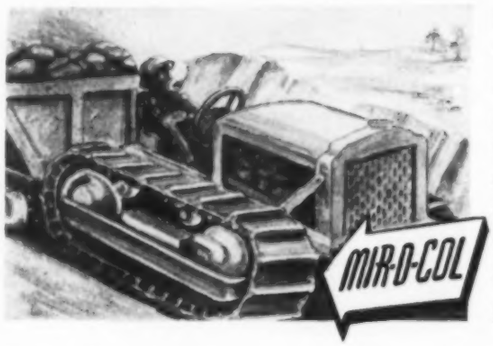
Climax engine bulletins which give full information—specifications, performance curves, outline dimensions and complete description. Address your letter to Climax Engineering Company, 1807 South Fourth St., Clinton, Iowa.



HOW TO WIN the MAINTENANCE BATTLE

on the

EQUIPMENT FRONT

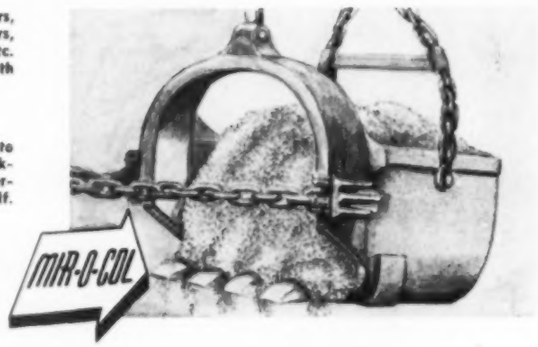


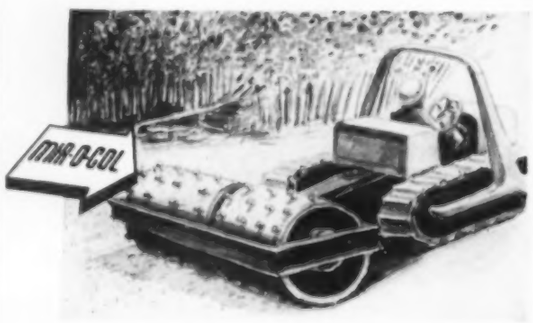
Keep operating speeds up, maintenance costs and expensive service interruptions down, by hard facing with Mir-O-Col those equipment parts that must withstand extreme conditions of wear from abrasion and impact.

Above: Tractor grousers, sprockets, end connectors, idler wheels, track rails, etc. should be hard faced with Mir-O-Col.

Right: Mir-O-Col applied to the teeth of drag-line buckets will reduce loss of operating time by more than half.

Below: Building up the feet of a sheep's foot tamper will insure efficient and continuous operation.





Send for your free copy of the "Weldor's Guide to Successful Hard Surfacing Technique."

Inquiries invited from interested distributor organizations. Several attractive territories available.

MIR-O-COL ALLOY CO.

HARD SURFACING RODS
FERRO-ALLOY CASTINGS

"There's Nothing Accidental About Quality"

2416 EAST 53rd STREET
LOS ANGELES 11, CALIF.

(*Continued from page* 126)

construction sloped toward the roadway and surfaced with a distinctive concrete.

Forms and Concrete

Bridge construction on the various contracts was favorable for the repeated use of panel forms, and the contractors almost universally employed this type of formwork. Transit-mixed concrete was readily procurable in desired quantities, and most of the bridge contractors made use of this convenient source of supply. Where possible, the truck mixers discharged the concrete directly through short chutes into the forms, and parts of the structures beyond the reach of the trucks were concreted by means of buckets handled by cranes. On the two bridges across Rouge River, however, W. J. Meagher, contractor, Bay City, Mich., placed concrete through 6-in. pipe line with a single-chamber Pumpcrete unit. This machine placed up to 273 yd. in one pour, at an average rate of 21 yd. per hr. In deck construction, a swivel chute equipped with trap door gates facilitated concrete placement from the end of the elevated pipe line.

Bridge Contracts

Starting at the west end of Section 3, the bridge contracts are as follows:

Two expressway bridges over Southfield Road, Bryant and Detwiler, Detroit;

Van Born Road over Southfield Road, Darin and Armstrong, Detroit;

Southfield interchange, Darin and Armstrong, Detroit;

Two twin box culverts at Ecorse Creek, Carl E. Goodwin, Allegan, Mich.;

Two bridges over Outer Drive, W. J. Storen, Detroit;

Two bridges over Oakwood Boulevard, Peninsular Construction Co., Grand Rapids, Mich.;

Two bridges over Rouge River, W. J. Meagher, Bay City, Mich.;

Two bridges over Greenfield Road (separate superstructures on continuous abutments with distance between fascia beams reduced to 10 ft. as roadways converge in approach to depressed portion of expressway), L. A. Davidson, Lansing, Mich.;

Expressway bridge over interchange access road to Gate No. 10, Ford Motor Co., Rouge plant, Fry & Kain, Lansing, Mich.;

Bridge to carry D.T. & I.R.R. over this access road, W. J. Storen Co., Detroit, (Steel fabrication by American Bridge Co. under separate contract);

New York Central R.R. junction yard branch tracks over expressway, Darin & Armstrong, Detroit (Steel fabrication by R. C. Mahon, Detroit, under separate contract);

(*Continued on page* 130)

NITRO STARCH BASE

High Explosive Efficiency

IN MINING • QUARRYING • LOGGING AND CONSTRUCTION

Plus THREE ADVANTAGES FOR YOU!

WILL NOT PRODUCE HEADACHES from handling . . . reduces discomfort from breathing muck pile fumes. Better working conditions for you and your men!

WILL NOT FREEZE or leak at Arctic or Tropic temperatures. Maintained high efficiency . . . anywhere . . . anytime!

WITHSTANDS IMPACT in high-powered Rifle Bullet Test. Greater safety for workers!

From "Fortress Europe" to the lands of Nipponese domination, Trojan Products are helping in blasting a path of destruction . . . clearing the way for a quicker, final Victory. Vital in war, Trojan Products were intended for peace . . . were designed for the construction and development of better things for a finer way of life. May the intended use of Trojan Products be their only use . . . soon!

BUY MORE BONDS!

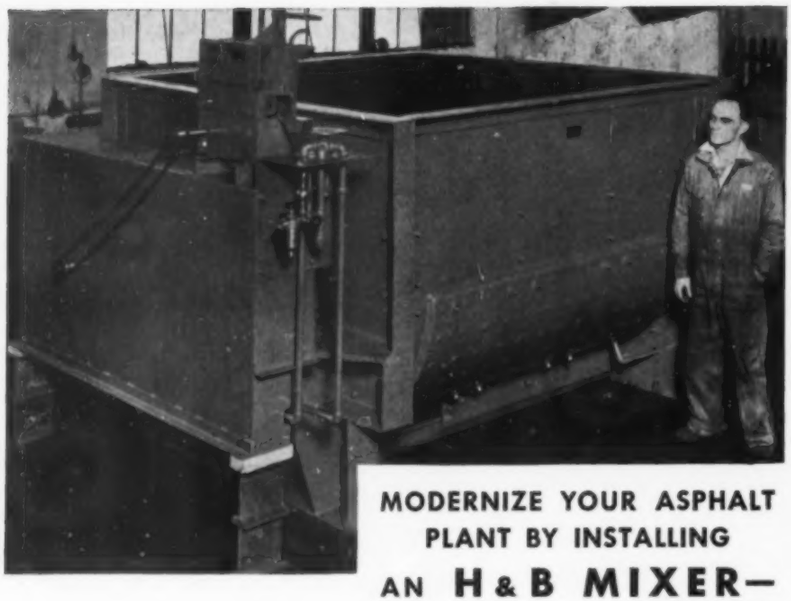
EXPLOSIVES 1905 TROJAN 1944 CHEMICALS

POWDER COMPANY

ONE OF AMERICA'S OLDEST HIGH EXPLOSIVES MANUFACTURERS

PLANTS: SEIPLE, PA. • ROBERT, CAL. • MAGAZINES STRATEGICALLY LOCATED THROUGHOUT THE NATION

OFFICES: ALLENTOWN, PA. • SAN FRANCISCO, CAL. • LOS ANGELES, CAL. • PORTLAND, ORE. • NEW YORK, N. Y.



MODERNIZE YOUR ASPHALT PLANT BY INSTALLING AN **H & B MIXER—**

H & B Asphalt Mixers are designed and built to give continuous, trouble-free, economical service under the most severe operating conditions. Careful engineering study, backed by nearly fifty years of specialized experience and applied to the suggestions and experience of practical plant operators, insures equipment that is dependable, economical, durable. 15 standard models (both steam and hand operated) ranging in batch capacity from 400 lbs. to the 8,000-lb. giant shown above. Write for literature and prices.

H & B ESTABLISHED 1867

HETHERINGTON & BERNER INC.
700 Kentucky Ave., Indianapolis 7, Ind.
America's Pioneer Builder of Asphalt Plants

do the shovels you're using . . .
WEAR-BACK HERE?
BREAK HERE?
TUBULAR SHANK
THIS SHOVEL HAS A BACKBONE
17 GAUGE
13 GAUGE
17 GAUGE
(SOCKET)
(FROG)
All Formed of Thicker Steel
(CUTTING EDGE)
RAZOR-BACK Shovels
are 60% thicker at these points of wear and strain — taper to the sides. Give you 13 gauge strength and stiffness, only 15 gauge average weight.
THE UNION FORK & HOE CO.
654 Hocking Street Columbus 15, Ohio
ALSO STONE, BALLAST, INDUSTRIAL FORKS, ASPHALT AND ROAD RAKES — DISTRIBUTORS EVERYWHERE

(*Continued from page* 128)

Schaeffer Road over expressway, L. A. Davidson, Lansing, Mich.;

Rotunda Drive over expressway, D. T. Frank, East Lansing, Mich.;

New York Central main line over expressway, W. J. Meagher, Bay City, Mich. (Steel fabrication by Bethlehem Steel Co. under separate contract);

Miller Road over expressway, Darin and Armstrong, Detroit;

Two bridges for Detroit Terminal R.R. tracks over expressway, Darin & Armstrong, Detroit (Steel fabrication for one by American Bridge Co. and for other by Worden-Allen Co., Milwaukee, Wis., under separate contracts);

Bridge to carry Pere Marquette Ry. over expressway, L. A. Davidson, Lansing, Mich. (Steel fabrication by American Bridge Company, Pittsburgh, Pa., under separate contract);

Bridge to pass westbound expressway traffic under Michigan Ave. (Approved for contract in near future).

Additional contracts, included under the structural classification of the accompanying tabulation, are a steam tunnel by Couse & Westphal, Detroit, and ¼ mi. of bituminous concrete paving on Miller Road (temporary) by Julius Porath & Son Co., Detroit.

The most unusual contract in the classification for highway work is one for a sewer, 48-in. to 72-in. diameter and 3,740 ft. in length, awarded to A. Arcari Construction Co., Detroit. About 2,750 ft. of the sewer, including 1,610 ft. of 72-in., 945 ft. of 66-in., and 200 ft. of 48-in., was built in tunnel through soft blue clay. All the 72-in. sewer tunnel and some 200 ft. of the 66-in. were driven under about 8-lb. air pressure to permit an advance of 16 ft. in each heading before placing the concrete lining. Five shafts were sunk to a depth of about 30 ft. to facilitate construction of the 2,750 ft. of tunnel, driven in two directions from each shaft.

Engineers in Charge

Design and construction of the Detroit Industrial Expressway are under the direction of the Michigan State Highway Department, with the following men in charge at department headquarters in Lansing: Charles M. Ziegler, state highway commissioner; H. T. Ward, chief deputy commissioner; Harry C. Coons, deputy commissioner-chief engineer; Scott A. Baker, acting construction engineer; L. W. Millard, bridge engineer, and James Flynn, assistant bridge engineer. Responsibility for all engineering and construction operations in the field rests with C. H. Brown, assistant metropolitan engineer, and H. J. (Pat) Conroy and Paul Ueberhorst, area engineers on Expressway bridges.

7 hints to help you stretch bearing life!

Working with many fleet men on wartime bearing problems, our Engineers have listed the most important things they've found to help make bearings last longer. These suggestions are not new maintenance ideas but they have a *new significance* today. Be sure your new P. M. plan provides for continuously checking these important factors and that your shop men *know* how important they are.

A check list of suggestions to help you make bearings last longer

1

Use greater care in selecting bearing types and bearing materials to get those best suited to your equipment.

2

Make sure that wartime shop practice gives the *extra* care needed to fit bearings properly.

3

Check bearings frequently for wear to avoid failure and serious damage to other engine parts.

4

Reduce detonation by retarding spark or installing heavier cylinder head gaskets —or two regular gaskets.

5

Maintain proper engine temperatures. Crankcase temperatures should be above 140° F. to avoid condensation of moisture—low enough to prevent damage to wartime bearings or shortening oil life.

6

Keep crankcase cleaner by regular crankcase oil changes, always accompanied by change of oil filter pack and the inspection and necessary servicing of crankcase oil breather, ventilator and air cleaner.

7

Use the right grade and kind of motor oil. It should be light enough for adequate cooling but heavy enough for good protection. It should be stabilized against oxidation to prevent varnish and other deposit formations and should have detergent quality to keep contaminants from settling out of the oil.

A wartime oil for these wartime problems

Two of the most important items on the check list are—"Keep crankcase cleaner," and "Use the right grade and kind of motor oil." Hundreds of fleet operators have been turning to Stanolube H.D. in this emergency.

Stanolube H.D. has been available to the U.S. and fleet operators only since about the start of the war. Although civilian use is restricted, it is available to fleet operators because of the vital part they have in the war effort, and because of the severity of the service.

Stanolube H.D. is a detergent oil, but in addition, it is "heat-proofed" to retard oxidation. Therefore, it serves in *two* ways to prevent harmful deposits that cause bearings to wear out more quickly:

1. Because of its detergent properties, it holds fine dust and carbon particles in suspension so that they are removed when oil is drained. 2. The "heat-proofing"—inhibiting against oxidation—practically eliminates trouble resulting from oil oxidation products, which are particularly troublesome today.

More help on wartime bearing problems

Standard Automotive Engineers will be glad to give you the benefit of their experience. You can reach one of these Engineers by calling the nearest Standard Oil Company (Indiana) office, or by writing 910 S. Michigan Avenue, Chicago 5, Ill. In Nebraska, address Standard Oil Company of Nebraska at Omaha 2.

Oil is Ammunition . . . Use it Wisely

★ *heat-proofed* **Stanolube H.D.** ★

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ **FLEET CONSERVATION SERVICE**

Keep a ROOF over their heads on-the-job!

SKULLGARDS

Modern Skullgard head protection is doing a job of war-time calibre throughout the construction industries—guarding heads wherever hazards of falling or flying objects, blows or bumps exist on the job. Light in weight, comfortable to wear throughout the shift, M.S.A. Skullgards interpose the great strength of laminated bakelite between hazards and the worker's head, with tremendous resistance to fracture. M. S. A. Skullgards do not deteriorate from exposure to weather, perspiration, oil, grease, water or common chemicals. They are well balanced and easy fitting on the head, with cradle suspension and flexible sweat band. As the standard work hat of today, "SKULLGARD" is *your* standard specification for head protection! Write for Bulletin DK-11!

MINE SAFETY APPLIANCES CO.

BRADDOCK, THOMAS AND MEADE STS.

PITTSBURGH, PENNSYLVANIA

Rebuilding in China

(*Continued from page* 82)

narrow strips and these strips are woven through the framework to make the walls. Next mud is mixed with rice straw by tramping feet and the mixture is used to plaster the walls inside and out.

For white walls, lime is smeared over the mud. For dark gray walls, which blend well into the landscape and lessen the danger of bombing, the lime is mixed with charred pine. For most other colors paints are available but few people go in for the luxury of paint. Ceilings are mats of woven bamboo, sometimes covered on the underside with rice paper. Floors usually are made of something called three-in-one earth which is a mixture of lime, coal ashes and earth or sand, which produces a sort of cement. Many places have nothing but earth floors, but some, luxurious indeed, have wooden floors, usually made of cedar.

Some of the roofs, all of them slanting because of the persistent rains, are covered with small tiles and some with rice thatch. A thatched roof is cooler in summer and warmer in winter, but costs more and must be repaired every year or so.

★ ★ ★

Two-Crane Team

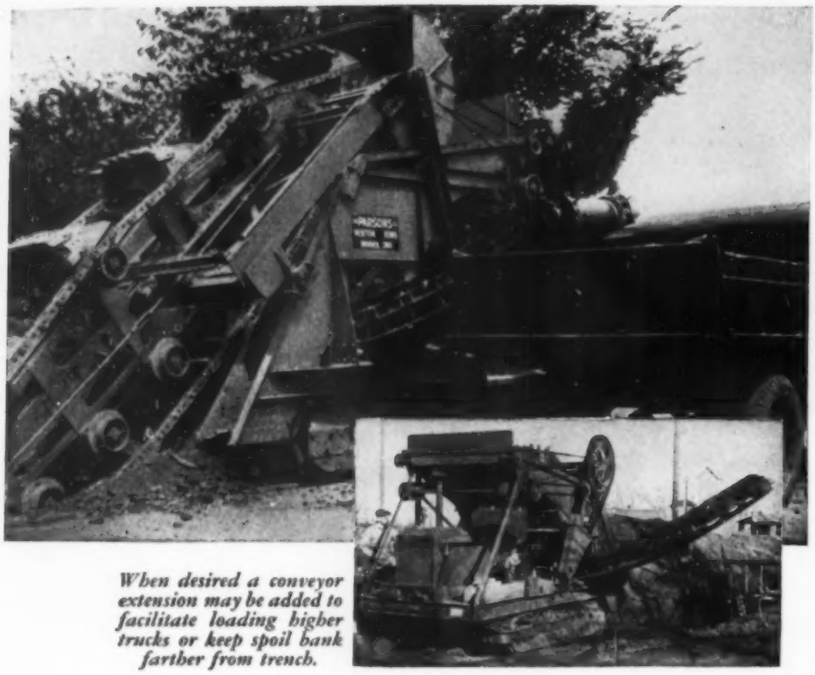
(*Continued from page* 56)

equipped with a ferrule extension of the driving cap, over the butt of the pile. The hammer unit is suspended by wire rope slings and bridles from the load line and bucket-closing line of the crane in such a way that it can be inclined and maintained at any desired angle. Wire rope loops attached to the hammer unit restrain the pile from slipping out of the driving cap.

To assist in raising the pile, the second crane takes a hitch with its load line on the creosoted timber stick at a point below the driving cap, and the two cranes in unison lift the pile with its attached hammer unit into position to permit the tip to be inserted into the pre-bored hole. The second crane retains its hold on the pile throughout the driving operation to steady the long pile and help support it at the correct batter angle. As driving progresses, the second crane utilizes its tag line as necessary to provide further steadying effect, hitching the latter line at the same point as the load line. Steam for the hammer is supplied from separate boiler unit on the ground.

Thirty-four NORTHWESTS for
When planning for the future, think this over and remember that for 20 years not less than 1 out of every 3 Northwests was a repeat order in the hands of the country's leading contractors.
NORTHWEST ENGINEERING CO., 1728 Steger Bldg., 28 E. Jackson Blvd., Chicago 4, Ill.
These Associated Companies
Arundel Corporation
Consolidated Engineering Co., Inc.
Hardaway Contracting Co.
NORTH WEST
and EVERY ONE a ROCK SHOVEL!
-and when you have a real Rock Shovel you won't have to worry about output in dirt

PARSONS



When desired a conveyor extension may be added to facilitate loading higher trucks or keep spoil bank farther from trench.

QUICK SHIFT CONVEYOR

The arc type discharge conveyor on a Parsons Trencher shifts through the machine by power so that spoil may be deposited on either side of trench as desired by the operator. This shift may be made in less than fifteen (15) seconds so that an obstruction can be cleared while machine is digging —a most important feature when operating in close quarters. The shift is by worm and worm gear which automatically locks conveyor in any position.

The conveyor is permanently located for height and does not vary when boom is raised or lowered. Trucks may, therefore, be loaded at fixed position discharge height.

The spoil to be retained for back-fill is piled on opposite side of trench by merely moving a lever to reverse the direction of belt. Investigate Parsons superiority before you buy.

THE PARSONS COMPANY
NEWTON, IOWA

TRENCHING EQUIPMENT

NORFORK DAM

(Continued from page 61)

existing light tower on the right training wall, which is near the center of the dam construction operations. According to the Otto K. Olesen Illuminating Co., Ltd., Hollywood, Calif., which supplied both lights, the Sperry-Aga unit is the most powerful wide-angle floodlight ever built. Covering an angle of 180 deg., the floodlight projects a layer of light 10 ft. deep through a horizontal half circle. Focused on the top of the dam, the light adds greatly to the other illumination.

Because of their low power consumption and the relatively small expense for carbon sticks, the cost of operating the two powerful light units is much less than that for conventional electric globe floodlights. The 2,000,000-candlepower searchlight, for example, rated 150 amp., 120 v. (18,000 w.), costs the contractors about 25 c. an hour for power and carbons. This light takes a ⅝-in. carbon electrode 36 in. long, which lasts about 5 hr. The power rating and operating cost of the wide-angle floodlight are about the same.

Thirteen floodlight towers illuminate the job in conjunction with the two high-power lights. The towers are equipped with nine to twelve 1,500-w. lamps, the number depending upon whether the tower is throwing light in two or three directions.

For the U. S. Engineers, Little Rock District, Capt. John L. Kemple is resident engineer in charge of the project. Construction operations are directed for the contractors, The Utah Construction Co., Ogden, Utah, and Morrison-Knudsen Co., Inc., Boise, Idaho, by C. B. (Woody) Williams, project manager.

★ ★ ★

Track Maintenance

(Continued from page 68)

500,000 annually, with 500,000 used for new construction and 2,000,000 for maintenance. For transcontinental main-line track the standard tie is 9 ft. long, 9 in. wide and 7 in. thick.

The first step in constructing new track, after surveys have been made, is to prepare the subgrade and construct cuts and

(Continued on page 136)

420 YEARS OF AXLE ENGINEERING EXPERIENCE*

TIMKEN AXLES

*Those members of our Engineering Staff, shown here, average 21 years Timken Axle Engineering Experience.

H. W. Alden, 35 years

C. A. Blair, 4 years

N. R. Brownyer, 17

L. R. Buckendale, 33 years

C. C. Davis, 30 years

E. V. Elconin, 29 years

L. W. Fischer, 22 years

A. J. Hazen, 15 years

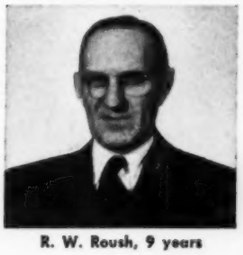
H. Johnston, 17 years

B. W. Keese, 25 years

C. F. Lundgren, 17 years

M. B. Morgan, 23 years

E. F. Petsch, 26 years


R. W. Roush, 9 years

W. F. Scheel, 26 years

W. J. Shelton, 20 years

R. H. Stridiron, 23 years

R. K. Super, 5 years

A. P. Woods, 28 years

A. W. Wothe, 16 years

THE TIMKEN-DETROIT AXLE CO., DETROIT 32, MICH. • WISCONSIN AXLE DIVISION, OSHKOSH, WIS.

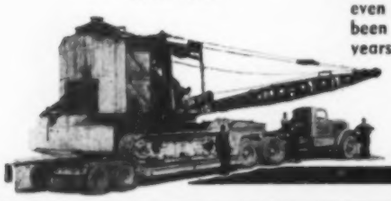
ON ROGERS TRAILERS

AMERICA'S shipbuilding industry will launch more ships in 1944 than all the rest of the world combined.

ROGERS TRAILERS are a vital link in the mass-production method of ship construction for they are transporting heavy machinery . . . boilers, bulkheads, engines . . . speeding Victory ships down to the sea!

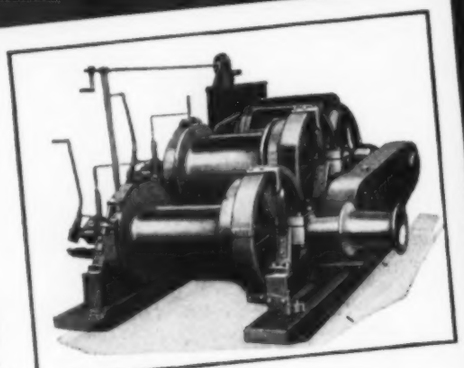
ROGERS TRAILERS are serving efficiently on the homefront too and new models which will be available when war contracts are completed, will be even more efficient than the multitude which have been so successfully operated by industry for many years.

EXPERIENCE *builds 'em*
PERFORMANCE *sells 'em*



ROGERS BROS. CORP.
ALBION, PENNA.

Hoists to Fit the Job



Lidgerwood hoists have earned a 70-year reputation for dependability and efficiency *on the job*. There's a Lidgerwood gasoline, steam, electric or Diesel hoist to fit every construction need. When you need a hoist inquire *first* of LIDGERWOOD.

HOISTS FOR:
CABLEWAYS
INDUSTRIAL PLANTS
CONTRACTORS
MINES—DOCKS
RAILWAYS

LIDGERWOOD
ESTABLISHED 1873
Manufacturing Company
MAIN OFFICE AND WORKS • ELIZABETH, NEW JERSEY

(*Continued from page* 134)

fills of standard width. This work was formerly done well in advance to allow the roadbed to settle, but now sheepsfoot rollers are used to tamp the fills in layers as constructed and also to consolidate the base of cuts. Rails, ties, plates, spikes, bolts and other fastenings are then distributed. Since virtually all present-day construction consists of extensions or additional double trackage, existing facilities permit much of this work to be accomplished with work trains. Distribution of material per mile calls for an average of 271 rails each 39 ft. long, 3,250 to 3,520 ties, 6,500 to 7,040 tie plates, 542 angle bars, 1,084 bolts, and from 13,000 to 14,080 spikes.

"Steel Gang" Places Ties

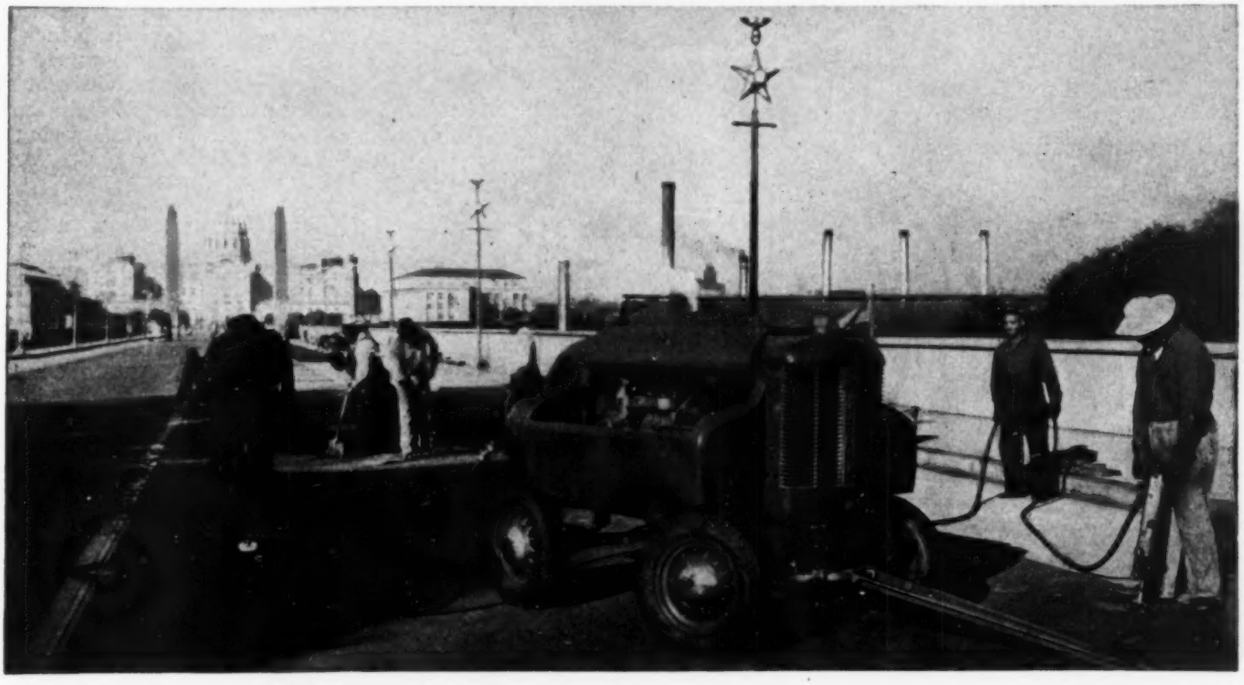
Rails are unloaded from flat or coal cars by derrick and must be dropped, both ends simultaneously, on an even surface to prevent damage. Ties are piled on the ground by hand, with care not to splinter or otherwise mar the wood fiber. After fastenings have been distributed along the right-of-way, a large crew of men known as the "steel gang" takes over. Ties are placed on the roadbed, 10¾ in. apart, averaging 20 in. c. to c., and requiring 24, 25 or 26 ties to each 39-ft. rail. Then the tie plates are attached to the ties by outside line spikes which are inserted in holes bored for that purpose and serve as a guide for the first rail. After the gage of 4 ft., 8½ in. has been established, line spikes are driven in the outside of the other rail.

Both rails are now in place, having been swung into position by a power crane and full spiking proceeds with the aid of air guns. Modern high-speed track calls for six to eight line spikes and four anchor spikes per tie. This requires eight-hole plates to permit staggering of the spikes, while in ordinary track, four-hole plates are used. Rail joints are bolted together with angle bars, with proper allowance for expansion being made as determined by the temperature of the rail. No rail is laid when the temperature is below zero.

When all rail and tie work is completed, ballast is delivered by dump cars and spread to the top of the rail. The kind of ballast depends on the source of supply. Among the materials commonly used are cinders, chats, oyster shell, gravel, volcanic ash, and iron slag, but crushed rock is considered superior and used whenever possible. In standard practice, ballast is deposited 6 to 10 in. under the bottom of the ties, even 12 in. in places where the ground is soft or poorly drained. In ordinary repair work, ballast is tamped into position with shovels, but in the case of new track it is spread over the entire sur-

(*Continued on page* 138)

EMERGENCIES REQUIRE QUICK ACTION!



Schramm Compressors furnish air on moment's notice!

Merely by easily moving a Schramm Air Compressor onto the job—and touching a starter button—you get all the compressed air you want—and the emergency job is sped along!

Illustrating the time Schramm was needed to furnish air so that a road atop a busy highway bridge leading to a state capitol could be repaired—quickly!

Schramm met all requirements because it could furnish the necessary air speedily—and the unit was lightweight and compact and thus easily towed about. This represented a big saving in hauling costs—plus plenty of action.

Many features contribute to "air-when-you-want-it" Schramm Compressors: (1) Completely water cooled to provide ideal performance both winter and summer. (2) Seven main bearing supports. (3) Mechanical intake valve. (4) More cylinders and lighter parts. (5) Forced feed lubrication.

If you are not already using a Schramm Air Compressor, it will pay you to write today for illustrated Bulletin 42-PA.

SCHRAMM INC.
THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

NOW you can get 10 basic books of

DAY-IN-DAY-OUT VALUE TO THE CIVIL ENGINEER

in one handy volume that—

. . . answers your questions in *any* division of civil engineering;

. . . is comprehensive, up-to-date and authoritative;

. . . blends theory, practice and fundamentals equally;

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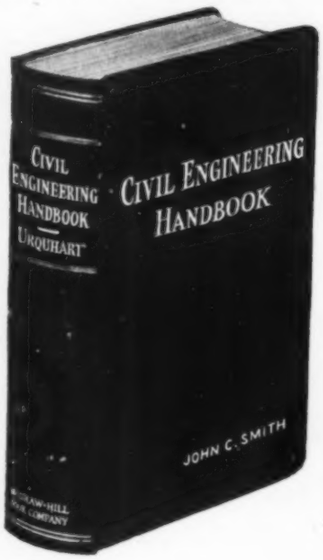
CIVIL ENGINEERING HANDBOOK

Editor-in-chief: Leonard C. Urquhart, Professor of Structural Engineering, Cornell University. Second Edition, 877 pages, 6 x 9, over 900 illustrations and diagrams $5.00

HERE are the fundamentals of the various subdivisions of civil engineering for men who actually plan, select, design, and construct civil engineering structures and projects. In each division a noteworthy specialist has contributed a compact treatise, developing fundamental theories as well as stating more involved ones, making the book not only a comprehensive reference work of modern civil engineering practice, but also adaptable for systematic study of any of the fields represented in it.

In this edition you will find surveying practice carefully defined; developments in highway and railroad work thoroughly covered; specialized data on design and construction of framed structures; new specifications for concrete and steel design to conform to approved specifications; important data on foundations, sewerage and water supply.



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—Construction costs of roads and pavements
—Mechanics of Materials
—Fluid pressure
—Pipes and open channels
—Flow of viscous fluids
—Measuremeat of flowing water
—Roof trusses
—Dead-load stresses in bridge trusses
—Lateral forces on bridge trusses
—Arches
—Slope-deflection
—Moment distribution
—Riveting and welding
—Bearing plates and grillage beams
—Bridges
—Mill Buildings
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—Mixers and mixing
—Buildings and walls, footings and foundations
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—Properties of soils
—Mechanics of soil resistance
—Caissons
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(*Continued from page* 136)

face and allowed to settle as the track is lifted 5 in. from the ground with power jacks. The ballast is shovel-tamped under the ties. This operation is repeated and, where necessary, a third application of ballast is made. The track is then permitted to carry traffic for a period of 30 to 60 days, with trains traveling at slow speed, and the ballast is then air-tamped and the track given a final surfacing and dressing.

Ballast Must Be Cleaned

Any type of ballast has a tendency to pulverize under the heavy pounding of trains and must be replaced at intervals. It is also affected by weather conditions, particularly moisture, and in times of flood or high water some is washed away. It is often necessary to clean ballast and put it back to use. This is done either with ballast forks or a mechanical device, usually during dry weather when it is easy to remove all foreign substances.

Division engineers are responsible for the maintenance-of-way and structures on their respective divisions. Directly under them are roadmasters and general bridge and building foremen. Roadmasters are in charge of section crews, directed by a foreman, who look after all phases of track repair and maintenance. They make frequent trips over their districts and all track is inspected daily by section men and their supervisors. In addition to the track, section men must maintain cattle guards, crossings, roadway signs, and right-of-way fences, as well as drainage of the roadbed.

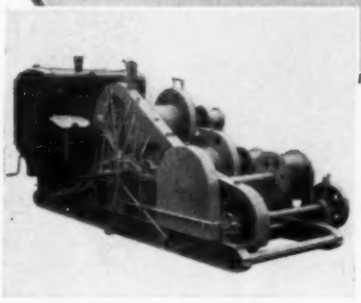
Safety Campaign Conducted

Safety is of prime importance in all phases of construction and maintenance. Approximately 21 per cent of the 55,000 Santa Fe employees make up these forces. In 1942 29.7 per cent of the fatalities and 27 per cent of all reportable personal injuries occurred in this department. A continuous safety campaign is, therefore, carried on, built around four safety meetings annually in each division. Employees are carefully trained in the proper handling of materials, such as ties and rails, to avoid crushed hands and fingers, and in the correct use of spike claw bars and other tools to prevent similar injuries.

As track jacks are large enough to cause a derailment, these tools must be used at the side of the track to eliminate any chance of their being left between the rails. It is important that the working mechanism of these jacks, which have a capacity lift of 15 tons, be kept free of dirt particles and in proper condition or a jack may trip under a heavy load and injure the operator. Power-drive track

(*Continued on page* 142)

American MATERIALS HANDLING FOR EVERY INDUSTRY



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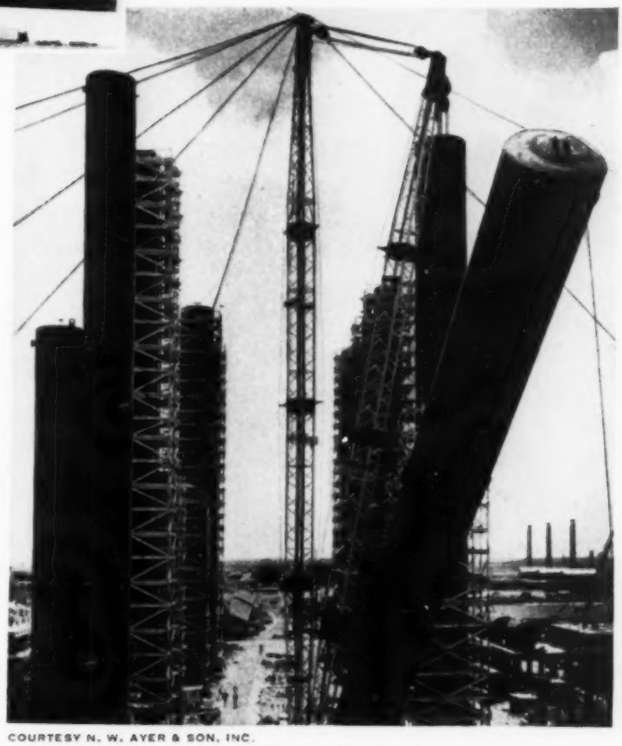

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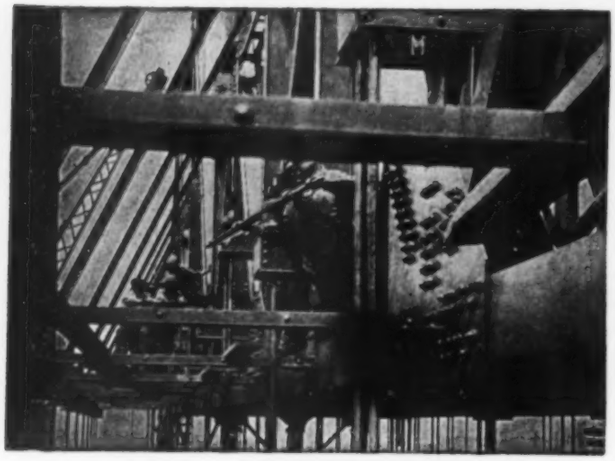

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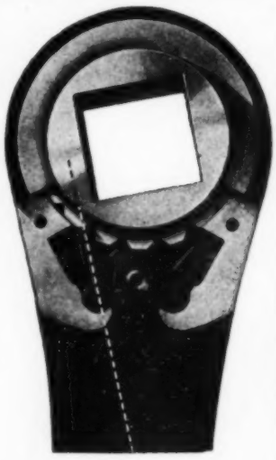

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Baker *Hydraulic* Gradebuilder on an Allis-Chalmers tractor skidding a scow over a Baker-built road, from the railroad to the "under-lake" mining project. C. A. Pitts, Ltd., Toronto, Ont. are general contractors.

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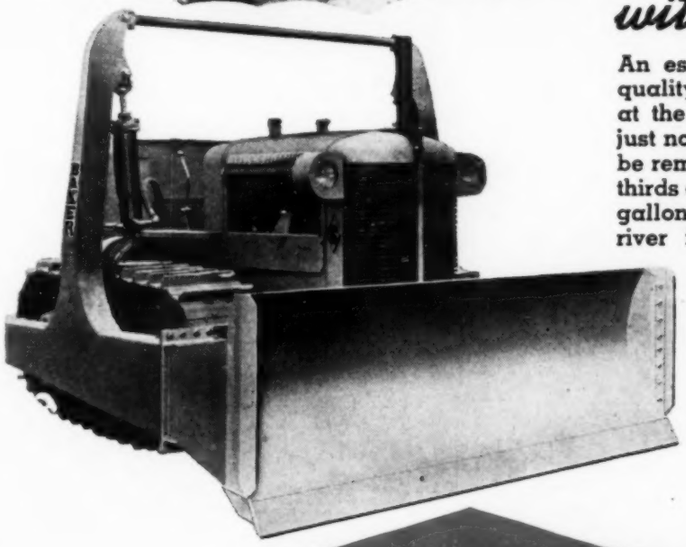

Baker *Hydraulic* Bulldozers and Gradebuilders are made in 12 models.

Logically, a number of Baker *Hydraulic* Bulldozers and Gradebuilders are being used to rush this job to completion. Operations were started in the spring of 1943. Baker's capacity for getting vast quantities of dirt moved faster—its ability to 'doze trees, logs and boulders and to pile, spread, level and compact, make it tailor-made for this job.

Bakers are earning "Distinguished Earth-moving Crosses" on scores of war jobs, piling up performance records that deserve your attention when you buy post-war equipment!

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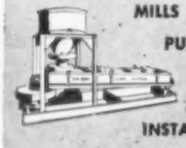

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ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN

(*Continued from page* 138)

tools, such as adzers, spike drivers, tampers and power picks, call for special training and supervision by the foreman in charge. Adzers, which are used to trim ties for tie plates, revolve in a circular manner and are too sharp and dangerous to be handled by amateurs. Operators usually wear shin guards as protection against flying objects. Men cutting rails with chisels wear goggles to protect their eyes. Members of track gangs are divided into groups or spaced apart to avoid being struck with their own tools. Safe scaffolds are a matter of first consideration in bridge and building work.

★ ★ ★

Giant Pump Station

(*Continued from page* 65)

pleted. Extension of the floodwalls to protect the lower part of the city adjacent to Mill Creek must await future construction.

Mill Creek drains an area of 155 sq. mi. and is subject to maximum recorded floods of 17,000 sec.-ft., requiring a pump station of huge capacity to handle potential flows when the barrier dam is closed against backwater from the Ohio River. During the course of the contract, Mill Creek discharged floods up to 13,000 sec.-ft. Six mammoth pumps are being installed under the present contract and provision is made for three more to increase the pumping capacity later, after storage area upstream from the dam has been further depleted by expected filling of the Mill Creek valley. The pumps are vertical-shaft, open-impeller, axial-flow type, with 120-in. impellers driven by 6,500-hp. electric motors, designed and rated for a pumping capacity of 1,500 cfs. against a 29-ft. static head. With the Ohio at maximum recorded stage of 80 ft., near El. 509 above sea level, the pumps will handle their rated capacity when the water level in the forebay of the pumping station stands at El. 480, discharging 9,000 cfs. through the barrier with six units in operation. The ultimate installation of nine pumps will be able to take care of 13,500 cfs. against a 29-ft. static head.

Some details of the pump station substructure and superstructure are indicated in an accompanying drawing which

shows the arrangement of construction cranes for handling forms, concrete and steel. Intakes of the pumps are protected by trash racks supported on horizontal steel beams grouted into the concrete diaphragms between the intakes. The pump station is 270 ft. long. Adjacent to the east end is a rigid-frame reinforced-concrete box-type discharge bay, 40 ft. wide at the throat. Minimum vertical clearance from the top of the footing slab to the underside of the deck slab is 66½ ft. The footing slab, resting on battered concrete piles, varies from 9 to 6 ft. in thickness, and the deck slab is 3½ and 3 ft. thick.

To catch logs and other large drift, a fender wall of reinforced-concrete A-frame bents and piers is placed across the upper end of the forebay at an angle with the stream and the pump station. Spacing of the fender columns is 10 ft. inside to inside horizontal clearances; the bents, on 50½-ft. centers, carry the deck of a roadway for trucks and a truck crane used in cleaning debris from the fenders. For 20 ft. below roadway elevation, El. 494 to El. 474, the upstream face of the fender structure is closed by a continuous curtain wall.

Gravity-Type Walls

Except for the fender wall, all walls are gravity type, made up of concrete monoliths bearing on precast piles, both vertical and batter, the direction of batter being such as to resist pressures of earth backfill or floodwaters against the walls. A continuous cutoff wall of steel sheetpiling extends under the right abutment, pump station, discharge bay, and floodwall. The cutoff is made up of various sheeting sections, corresponding to U. S. Steel Corp. M112, M116, C12A, C12B, and Bethlehem Steel Co. DP1, DP2, ST4, CP41. It was possible to install all the steel sheetpiles vertically except at the south edge of the pump station footing, where 200 DP1 piles 32½ ft. long had to be driven at a 3 on 1 batter for the entire length of the station in order to clear battered concrete bearing piles under the same structure.

More than 1,100 concrete bearing piles support the pump station. About two-thirds of these piles were driven with an upstream batter and about one-third with a downstream batter. The batter bearing piles were a minimum of 31½ ft. long and were cut off at El. 442.5, which also was the top elevation of all the battered sheetpiling under the pump station.

All concrete piles are designed for 60-ton loading, developed by skin friction in silt and clay. Without exception, they developed greater bearing than the design requirement, some of them taking 100 blows to the inch under an 11B hammer

(Continued on page 148)

More Speed for every service operation . . . Snap-ons deliver it . . . with less effort, greater accuracy and utmost safety! Throughout the construction industry, Snap-on tools are helping keep irreplaceable equipment on rigid wartime schedules. The Snap-on line covers the broadest range of service requirements, from smallest service tools to Extra Heavy Duty and Jumbo wrench sets. Snap-on's direct-to-user tool service is available through factory branches in 37 principal cities. Write for catalog of the complete Snap-on line.

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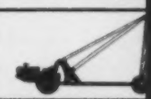
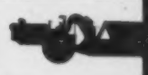
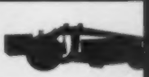
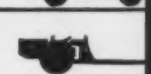
SUPER C TOURNAPULL** (Capacity-15 heaped yards)	★		●	★	★			★	★	★		●	★					★	
SUPER C TOURNACRANE** (Lifting Capacities up to 20,000 lbs.)	●	●	●	★		★	★	★	●	●		●	●	●	★	●			
SUPER C TOURNATRAILER** (Capacity-17 heaped yards)	★		●	★	★	●	●	★					●					★	
MODEL D TOURNAPULL† (Capacity-2.3 heaped yards)	●		★	●				★	★	★	★	★	★	★				●	
MODEL D TOURNACRANE† (Lifting Capacities up to 10,000 lbs.)			★	●		★	●	★	●	★	★	★	●	●	★	★	★		
MODEL D TOURNATRUCK† (Capacities-5 tons)	●		★	●		★	●	★		★	★	★	●		●	★	★		
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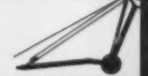
CARRYALL SCRAPERS (for all tractors fitted with PCU's)	★	●	●	★	★	★		★	★	★	★	●	★	★				★	
ROOTERS (for all tractors fitted with PCU's)	★			★	★		●	★	★	★	●		★	●					
TRACTOR CRANES (for all tractors fitted with PCU's)	●	★	●	●		★	★	★	●	●		●	●	●	★	★	★		
DOZERS (for all "Caterpillar" tractors)	★	★	★	★	★	●	★	★	★	★	●	●	★	★	★	●		●	
SHEEP'S FOOT ROLLERS (for all tractors)	★		★	★	★			★	★	★			★						

Don't take a chance of going into the "red" with slow, out-dated equipment on your postwar projects. Ask your LeTourneau dealer how the rubber-tired power of Tournapulls and the big capacity of LeTourneau rigs can get your jobs done faster and put more money in your pocket. See him NOW.

**15-yd. Carryall Scraper, 17-yd. Tournatrailer and Tournacrane (20,000 lb. lifting capacity) interchangeable on same Super C Tournapull prime mover.

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Confirms Ability of Insulation to Withstand Shorts Due to Voltage Surges

• Now, a new electronic test shows *visually* that the insulation of every coil, every turn, and every phase of a G-E Tri-Clad motor winding has the strength to withstand the voltage surges that are a cause of shorts and grounds in service. Thanks to this new G-E development, no undisclosed insulation weakness can "get by."

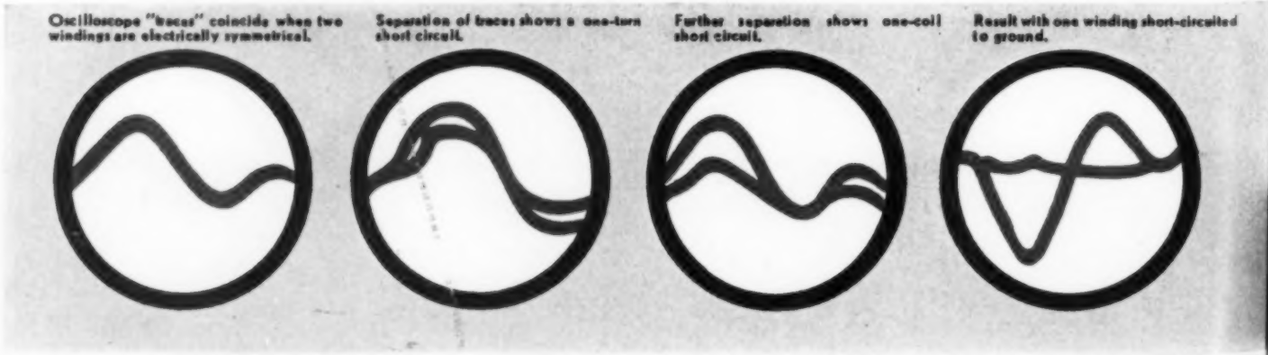
The new test method* subjects each coil in the assembled motor to a steep-front surge impulse, similar to a high-voltage transient of actual service. A cathode-ray oscilloscope indicates the performance of the winding under this sudden stress.

Only a motor with perfect insulation, and with the phases symmetrical, will give a single, clear-cut "standing wave" on the screen. The test indicates not only the condition of turn-to-turn insulation, but also that of coil-to-coil and coil-to-ground insulation.

This test is now applied to all G-E Tri-Clad motors, and to many other G-E motors and generators, as a regular step in production. Its advantages are so great that its use is widening throughout the motor industry.

*For complete details, see "Insulation Testing of Electric Windings," Trans. of A.I.E.E., Vol. 62, pp. 203-206.

HERE'S HOW WINDING STRENGTH SHOWS UP ON THE OSCILLOSCOPE "WINDOW"


Oscilloscope "traces" coincide when two windings are electrically symmetrical.
Separation of traces shows a one-turn short circuit.
Further separation shows one-coil short circuit.
Result with one winding short-circuited to ground.

TEST Tells the "Inside Story" of Motor Windings

Production-line test of G-E Tri-Clad motors with new electronic tester. Operator turns transfer switch to take reading on each phase.

An Individual Check of Each TRI CLAD Motor Gives Extra Assurance of Unfailing Service

At each Tri-Clad motor factory, a production-line test setup like the one shown above is regularly in service. The motor windings are checked by this new test as an *additional* step in G.E.'s strict testing procedure. Other winding tests include the high-potential and high-frequency tests, in addition to many quality tests made on Formex* wire and other winding materials before they are used in the motor windings. Whenever you buy or specify a G-E Tri-Clad motor for your plant or machine, you get extra assurance of unfailing service. *General Electric Company, Schenectady, N. Y.*

*Reg. U. S. Pat. Office.

Every week 192,000 G-E employees buy more than a million dollars' worth of War Bonds.

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(*Continued from page* 143)

delivering effective energy of 22,000 ft.-lb. per blow. In some locations, the piles probably picked up additional end bearing value on gravel. Some concrete piles were driven with a Vulcan No. 1 hammer, 5,000-lb. ram, 15,100-ft.lb. blow. A McKiernan-Terry 9B3 and two No. 7's were used on the sheeting, depending on length and driving resistance.

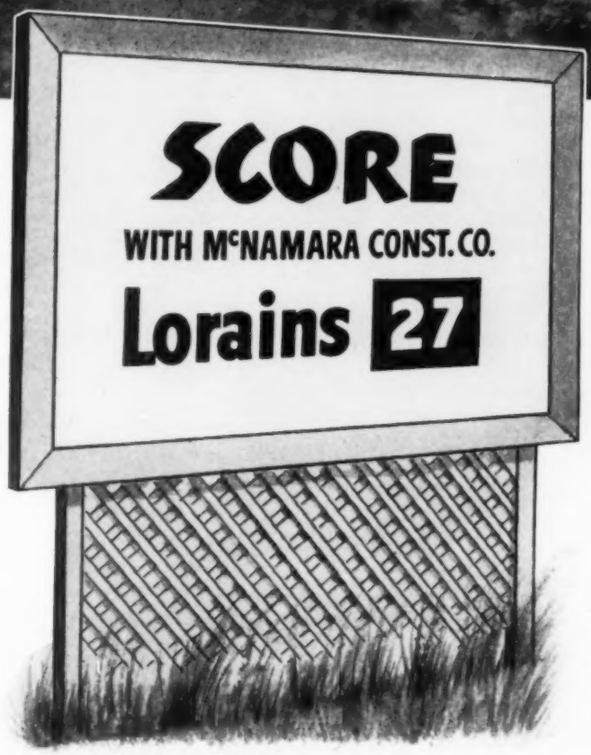
To resist uplift, dowel bars projecting from the heads of the concrete piles were welded to bar extensions running well up into the concrete footings. The welders used two portable Lincoln generating sets, a 300-amp. unit driven by gas engine and a 200-amp. powered by an electric motor.

Piledriving Methods

With the aid of air-water jets, concrete piles were put down at the rate of about one an hour, for an average of eight to ten per 8 hr. shift. Water was available at 70-lb. pressure from city mains, and this pressure was built up by means of a CH&E four-stage jet pump. A reserve Goulds three-stage pump was rarely used. Air for the jets was furnished by a Chicago Pneumatic 210-cfm. diesel-powered compressor or by a LeRoi unit of the same capacity. Other portable compressors on the job were a Sullivan 160, an Ingersoll-Rand 105, and a Schramm 110. In driving batter concrete piles, the jet pipe was suspended alongside the leads by means of a clevis or shackle running on a cable guide fastened at the top to the leads and at the bottom either to the leads or to the pile.

Nearly all the concrete piles were driven by a Koehring crane of 2-yd. capacity using contractor-built pin-suspended steel leads and a McKiernan-Terry 11B or 11B3 hammer. By lowering and raising the boom, 60 ft. long, the pin-connected leads, joined by right-angle struts to the heel of the boom, could be adjusted to either vertical or batter position. The same crane, with a 10-ft. section added to the boom, droye vertical steel sheetpiling without conventional leads, operating a 9B3 hammer on the load line; the hammer was guided by a steel H-beam hung on the bucket-closing line and dropped into the ground beside the sheeting. For batter concrete piles in close quarters, the contractors used timber-and-steel inclined leads which guided both the piling and the hammer on a 3 on 1 slope. Continuous walls of steel sheeting installed at a batter ordinarily were set and driven against wood pile-supported timber frames, as indicated by an accompanying photograph. After the piles had been driven to the level of the cap timbers, the frames were removed and driving was continued with the ham-

(*Continued on page* 150)



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OAKITE *Specialized* **CLEANING**

(*Continued from page* 148)

mer traveling on the H-beam leads, as shown by another picture.

Construction Procedure

In starting construction of the project, the general contractors temporarily diverted the flow of Mill Creek into the elliptical sewer, shown on the plan, capable of carrying 700 sec.-ft. under no head. This diversion facilitated construction of a cofferdam inclosing the discharge bay area. The three-sided inclosure consisted of earth embankments with steel sheetpile cores on the upstream and downstream sides and a connecting earth dike between them at the west side. Mill Creek was bypassed through an excavated channel of about 5,000 sec.-ft. capacity to the west of the cofferdam, and the embankment in the west approach to a railroad bridge immediately downstream was protected by driving a wall of DP2 deep-arch-web sheetpiles 45 ft. long. A strong flood estimated at 13,000 sec.-ft. severely tested this protection and folded some of the sheetpiles; the bank was held against complete washout with extreme difficulty.

After the discharge works had been completed in the first cofferdam, Mill Creek was returned to the newly constructed channel, and the west half of the project was shut off by steel sheetpile box coffers to enable work to proceed on the pump station. In drying out the excavated holes inside the cofferdams for piledriving and footing construction, the contractors made use of Moretrench wellpoints, which proved effective in lowering the level of standing water despite the limited perviousness of the silty clay soil. To operate the wellpoints, the contractors had on the job two 8-in. pumps (2,000-g.p.m. capacity) and three 6-in. pumps, one of which always was kept in reserve as a standby unit. Holes were kept dry with 26 self-priming pumps, 8-, 6-, 4-, and 3-in. size, manufactured by Jaeger, Construction Machinery, LaBour and Chain Belt (Rex).

Site Conditions—The site was no picnic ground. It had been used for years by the city as a dump, and debris including everything from bedsprings to brickbats had accumulated to a depth of 30 or 40 ft. Under the rubbish, starting at about El. 460, was a deposit of alluvial silt and clay extending to an underlying stratum of sand-gravel at about El. 415.

Excavation and Earthmoving

To remove the 265,000 cu.yd. of excavation, the subcontractor used three shovels, a Bucyrus-Erie 1½-yd., a Lorain 1¼-yd., and an Erie ¾ yd. Excavated material was hauled away from the site by a fleet of 4-yd. trucks and by three Koehring 10-yd. Traildumps, pneumatic-tired tractor-trailer outfits. The same equipment served the subcontractor in hauling to

(*Continued on page* 153)

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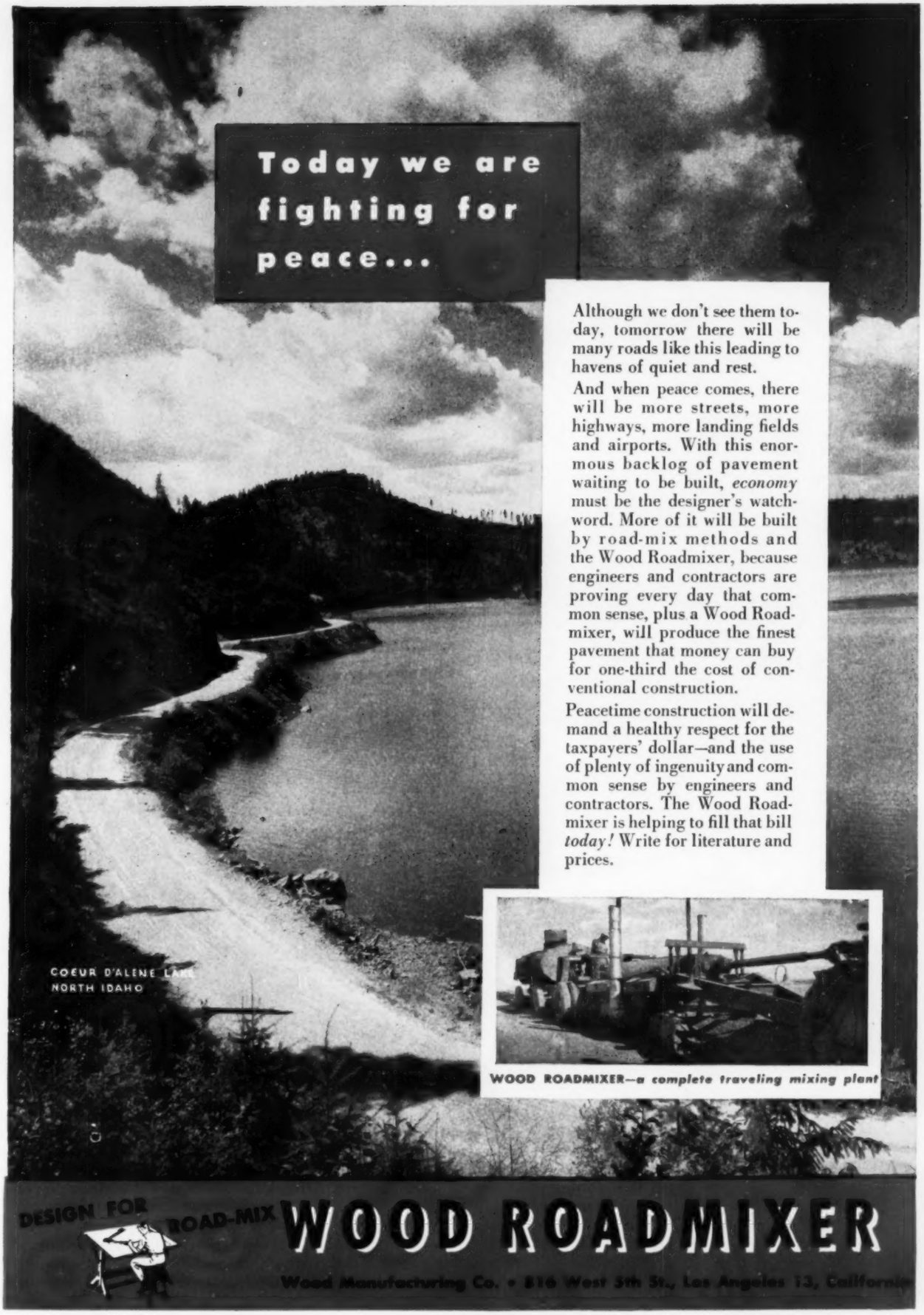

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Will American Free Enterprise Be Lost When the War is Won?

A Marine in the Southwest Pacific, formerly an Athey employee, wrote the above excerpts in a recent letter. "To our surprise and joy," he writes, "what should come crashing through the jungles, with water up to the hubs—the old Athey Trailer."

To him, the sight of an Athey Trailer and "Caterpillar" Diesel Tractor was a double thrill. It meant food and supplies for his outfit on the front lines and it was like meeting an old friend from home.

Transportation of supplies is a problem on any front—especially in tropical jungles or island outposts where building of haul roads is either impossible or impractical. On such operations Athey Trailers are moving large quantities of material dependably and safely *over footing too difficult for any other means of transportation.*

If you have a hauling problem, we suggest that you discuss it with your nearest Athey-"Caterpillar" Dealer or write direct to Athey Truss Wheel Co., 5631 West 65th Street, Chicago 38, Illinois.

Athey FORGED-TRAK TRAILERS

(*Continued from page* 150)

the job selected material for 21,000 cu.yd. of embankment and 85,000 cu.yd. of compacted backfill. The material was spread by the prime contractors with bulldozer-equipped tractors, four Caterpillars and an Allis-Chalmers, in 6- to 8-in. layers for compaction with LeTourneau and Blaw-Knox sheepsfoot rollers, drawn by

TRAILDUMP WAGON, a Koehring unit powered by diesel engine, brings in 10-yd. load of material for compacted backfill.

the same tractors. Two bulldozer-tractors, a Caterpillar and an Allis-Chalmers, were operated by the subcontractor on haul roads and dumps.

For building dikes, filling box coffers and excavating foundations and stream channels, the contractors had five dragline buckets, ¾-yd. to 1¾-yd., and four clamshell buckets, ½-yd. to 1¼-yd. Five cranes could be used for either clamshell or dragline digging. In addition to the Koehring 2-yd. machine already mentioned, the cranes included a Northwest 2-yd. (with a long boom and jib especially designed for concrete handling), a Northwest 1¼-yd., a Koehring ¾-yd. and a Lima ⅝-yd. Material which had to be transported was hauled by the contractors in three tractor-drawn Athey crawler wagons, two 8-yd. and one 10-yd.

Concrete Construction

Concrete requirements totaling 45,000 cu.yd. were supplied to the project by the Richter Concrete Co. in 3-yd. ready-mixed batches hauled from a central plant in truck mixers which served as agitators. The job was equipped with four 1½-yd. concrete buckets, two Insley and two Blaw-Knox, which were filled from the trucks and handled into the forms by cranes. An accompanying drawing shows the two principal concreting cranes, a Clyde Wiley whirley mounted on a mobile gantry frame at the downstream side of the pump station and the long-boom-and-jib Northwest unit capable of lifting buckets to fill wall forms 70 ft. high. These two cranes handled most of the

(*Continued on page* 154)

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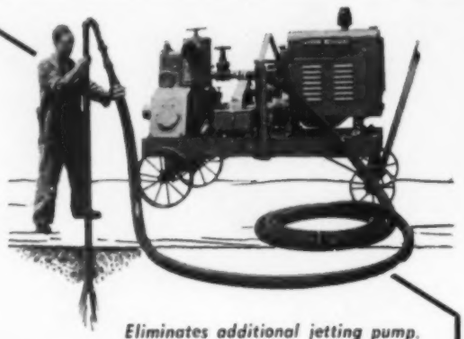

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(*Continued from page* 153)

concrete for the job, with supplementary assistance from the other crawler units.

Forms for exposed concrete surfaces were made up of ¾-in. Plycrete-grade plywood or were lined with ¼-in. plywood on ¾-in. wood sheathing. The job used 1,500 Universal Spirolock form ties.

Individual pours rarely exceeded 400 cu.yd. With both the gantry whirley and the long-boom Northwest crane handling concrete buckets, these two units on one day placed 422 cu. yd. around pump bar-

READY-MIXED CONCRETE hauled by truck mixer from central mixing plant is discharged into 1½-yd. concrete bucket for handling by crane into column forms of fender wall A-frame bent.

rels in 7 hr. for an average of 62 cu.yd. per hr., which was fairly representative of good progress.

Excellent concrete construction resulted from use of a workable mix properly vibrated in the forms. The principal vibrators were ten Chicago Pneumatic 417 air-powered units measuring 3 ft. 10 in. overall, with vibrating heads 4¼ in. in diameter by 17 in. long. These vibrators were supplemented by four smaller units, two Malls, one Master, and one Jackson.

Of the 45,000 cu.yd. of concrete on the job, 43,000 cu.yd. was Class C, the normal mix for mass concrete, designed for a compressive strength of 3,200 psi. at 28 days. Test cylinders ran well over the minimum strength requirement. The coarse aggregate was gravel, none of it crushed, in two gradations. Weight proportions per cu.yd. were as follows: cement, 423 lb.; water, 244 lb.; sand, 1,207 lb.; gravel, No. 4 to 1 in., 978 lb.; gravel, 1-in. to 2½-in., 1,207 lb.

One of the most valuable and versatile tools employed on the job was a LeTourneau tractor crane mounted on wide crawlers and operated by a Caterpillar RD6 tractor. This crane handled all kinds

(*Continued on page* 148)

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ROAD ROLLERS

GALION

MOTOR GRADERS

(*Continued from page* 154)

of equipment and materials around the project. It could lift its load about 20 ft. above the ground. For occasional use, the constructors had also another LeTourneau unit of about the same size and a contractor-built tractor crane with a 35-40-ft. lift.

Progress

Construction of the protection project started October 20, 1941, under a contract valued at about $2,500,000. Nine times during construction the work was flooded by high water, and the original contract time limit of 700 calendar days was correspondingly extended to make allowance for setbacks caused by the floods.

Temporary diversion of Mill Creek through the sewer was made in November, 1941, and the stream was turned into the bypass channel around the first cofferdams before Christmas of that year. By the following November, the creek had been restored to its channel through the discharge bay.

Completion of the project has been delayed by floods and inability to procure materials and equipment. It is expected that the pumping station will be completed, ready for operation, during the summer.

Supervision

Pump station and appurtenant works for local flood protection in the Mill Creek valley, Cincinnati, were designed and constructed by the Corps of Engineers, U. S. Army, under the general supervision of the Ohio River Division, Columbus, Ohio, and the immediate direction of the Cincinnati District. Col. C. L. Hall is division engineer, Columbus; and Lt. Col. Ralph J. Griffin is district engineer, Cincinnati. In the Cincinnati district, R. C. Vogt is principal engineer, and N. G. Fasnacht is chief of the construction operations section. The project has been built under the field supervision of George M. Wood, resident engineer, who previously had been in charge of design. Robert E. Ledford is assistant resident engineer.

Since the award of the construction contract to the joint contractors, the LaCrosse Dredging Corp., Chicago, Ill., and Minneapolis, Minn., has bought out the Ferd J. Robers Construction Co., Burlington, Wis., and the project has been completed by the merged organizations under the personal direction of P. C. Peterson, vice president and manager, LaCrosse Dredging Corp. Operations were supervised for the contractor by Harold A. Pickart, principal assistant superintendent, aided by George Peterson, assistant superintendent. Thomas C. Bright is contractor's engineer on the project.

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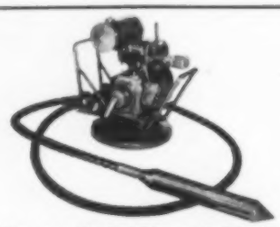

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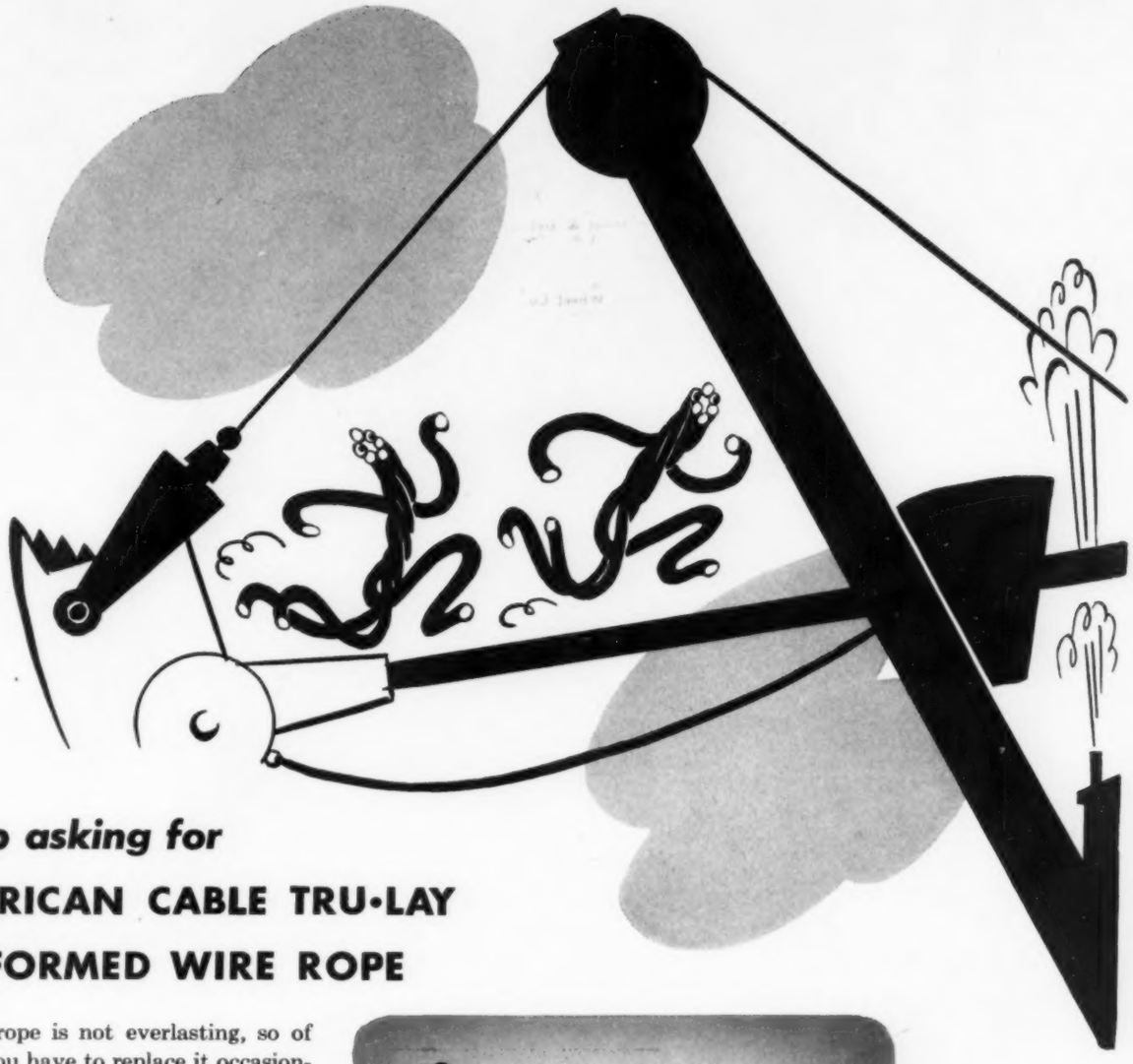

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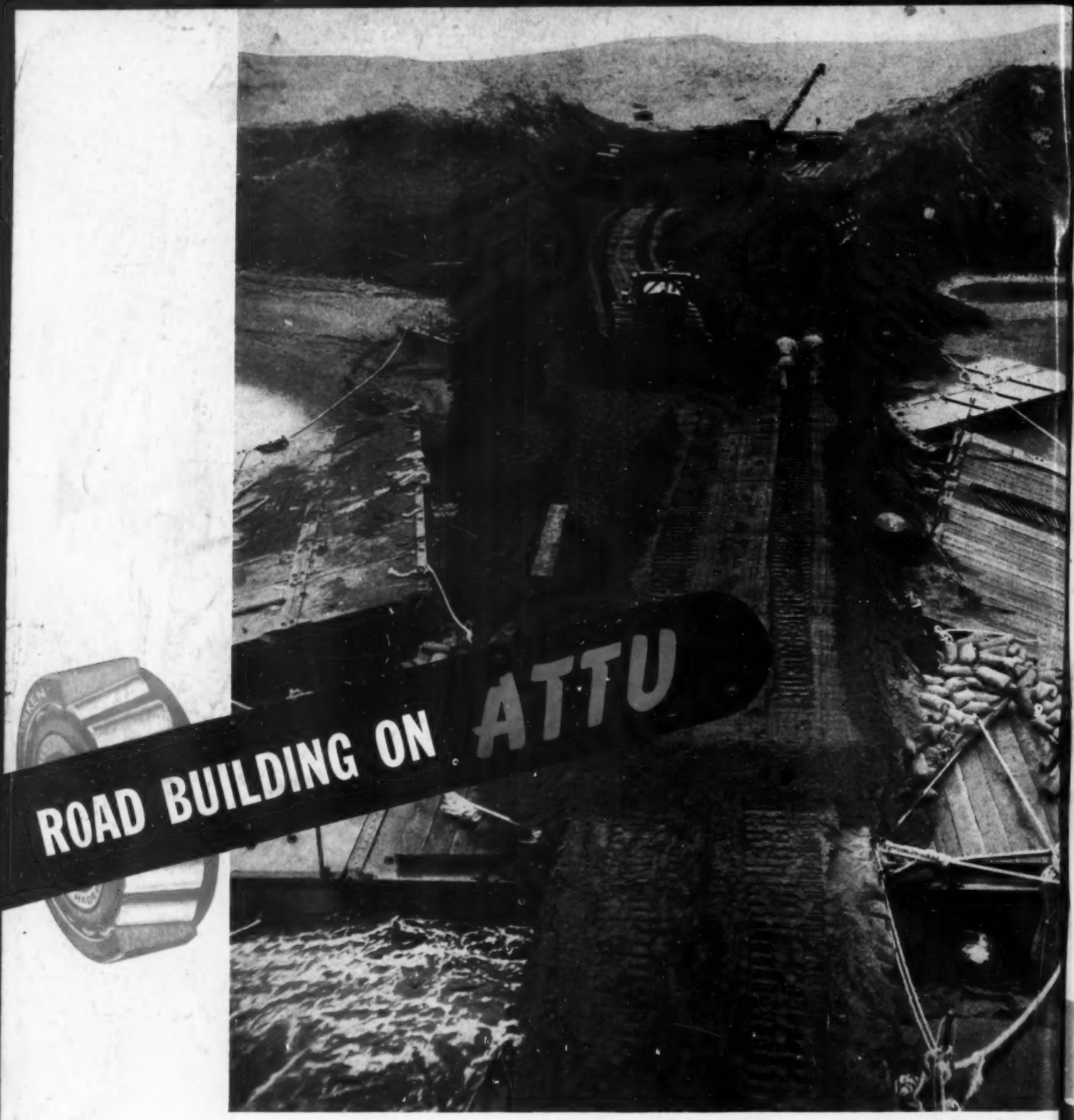

ROAD BUILDING ON ATTU

OFFICIAL NAVY PHOTOGRAPH

As American fighting forces advance, driving the enemy out of one stronghold after another, construction battalions follow right at their heels, repairing damage; consolidating conquered areas; building bases for further operations.

This photograph was made on the island of Attu soon after the Japanese had been driven out. It shows modern American construction equipment operated by Seabees and other construction units building a road where none existed before.

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